Round Lake Logging Dam
South Fork of Flambeau River
Park Falls Vicinity
Price County
Wisconsin

HAER WI-7

PHOTOGRAPHS
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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington D.C. 20240

HISTORIC AMERICAN ENGINEERING RECORD

ROUND LAKE LOGGING DAM

HAER WI-7

Location:	Along the south fork of the Flambeau River in the vicinity of Park Falls, Price County, Wisconsin. UTM: 15.726470.5089730
Dates of Construction:	Between 1883 and 1886. Partially reconstructed in the 1930s.
Present Owner:	U.S. Forest Service, U.S. Department of Agriculture
Present Use:	Preserved in situ by the U.S. Forest Service as a historical exhibit.
Significance:	The Round Lake Logging Dam is one of the few remaining early artifacts of Wisconsin's logging industry. It was built during the industry's log driving and log booming stages when cut timber was collected and sorted in man-made ponds before being driven downriver to be assembled into rafts for shipment to lumber mills. The dam was built by lumbermen relying on rules of thumb rather than by engineers working from established scientific principles.
Historian:	John N. Vogel, 1980. (Submittted in fulfillment of U.S.D.A. Forest Service Contract No. R9-02-80-6)

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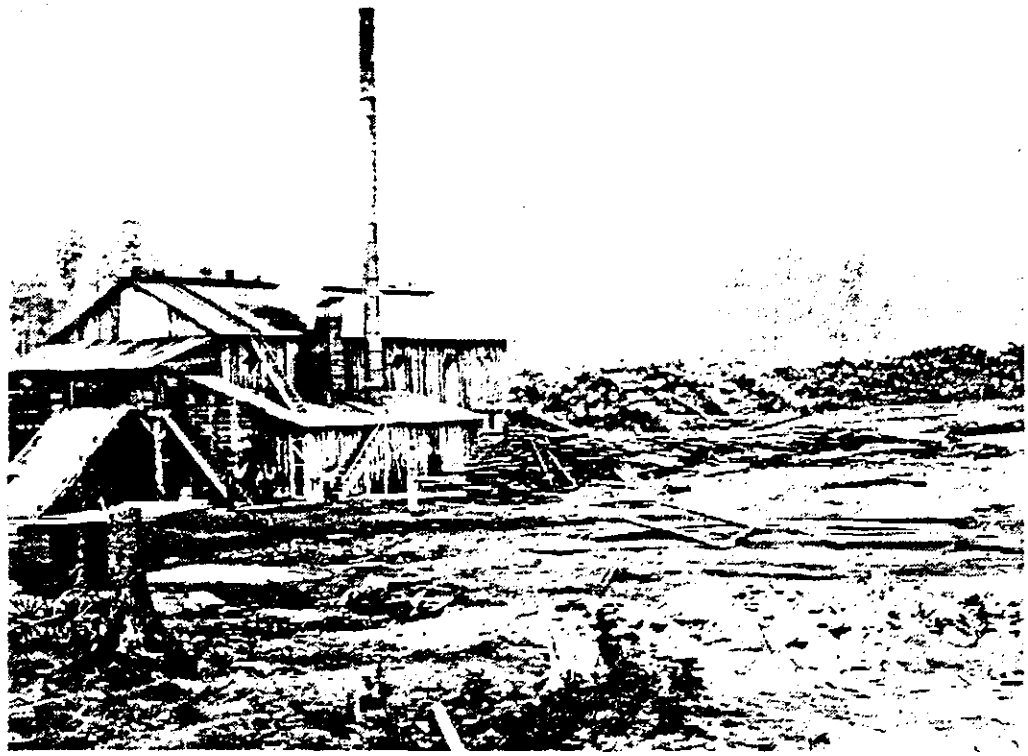
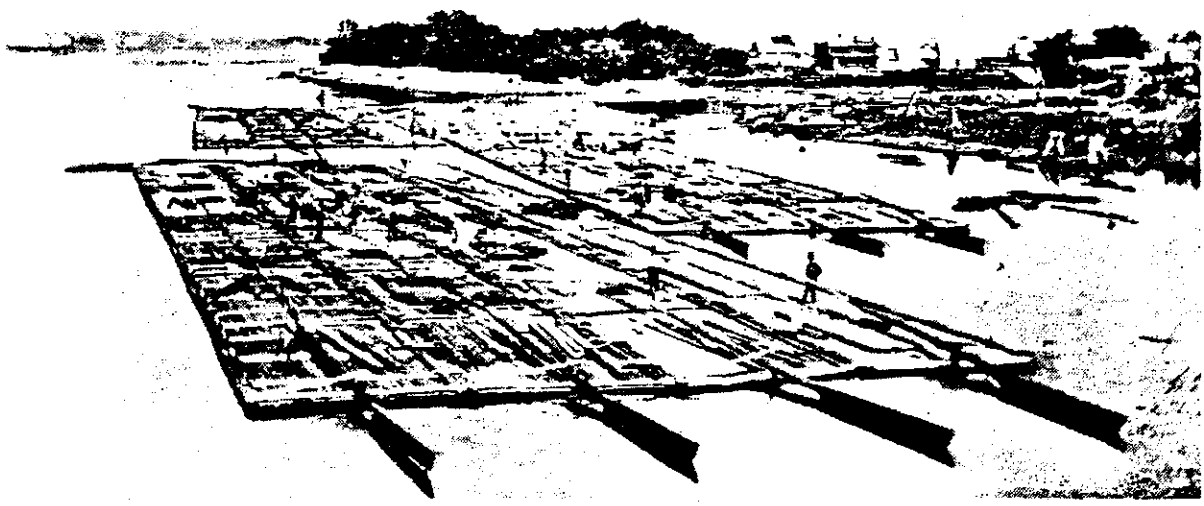


Stage One. (State Historical Society of Wisconsin)

INTRODUCTION

The focus of this study is the significance of a logging dam at Round Lake on the South Fork of the Flambeau River, which is a part of the Chippewa River drainage basin in northern Wisconsin. The importance of one of the last remaining artifacts of Wisconsin's logging history can only be seen within the wider social, political and technological context of the lumbering industry within the state. Part of its significance, however, goes beyond Wisconsin to the development of the Weyerhaeuser corporate system of forest acquisition, log booming and manufacture of lumber. It also involves an interesting portion of the history of land speculation by Ezra Cornell and the financial roots of the land grant college at Ithaca, New York.

As the logging industry moved out of New England and became established in Wisconsin, it went through three stages of development. The initial stage was the establishment of an individual lumber mill. Nearby timber was cut, sawed and sold locally. The early lumber mills served a limited regional market, which they soon exhausted. The height of this stage occurred in the 1830s and 1840s. The second stage began when the millowners had to look upriver for timber and downriver for new markets. Securing new sources of trees necessitated building flooding dams and driving cut logs downriver to sawmills located close to transportation facilities. The second stage began in the 1850s and actually continued until the forests were depleted.



Stage Two.
(State Historical Society of Wisconsin)

In the final stage which ran parallel with the log driving stage on the Chippewa River, companies purchased large tracts of forestland and organized huge river drives to booming areas where logs were stored, sorted and then rafted to corporate sawmills on the Mississippi River.

Stage Three. (State Historical Society of Wisconsin)

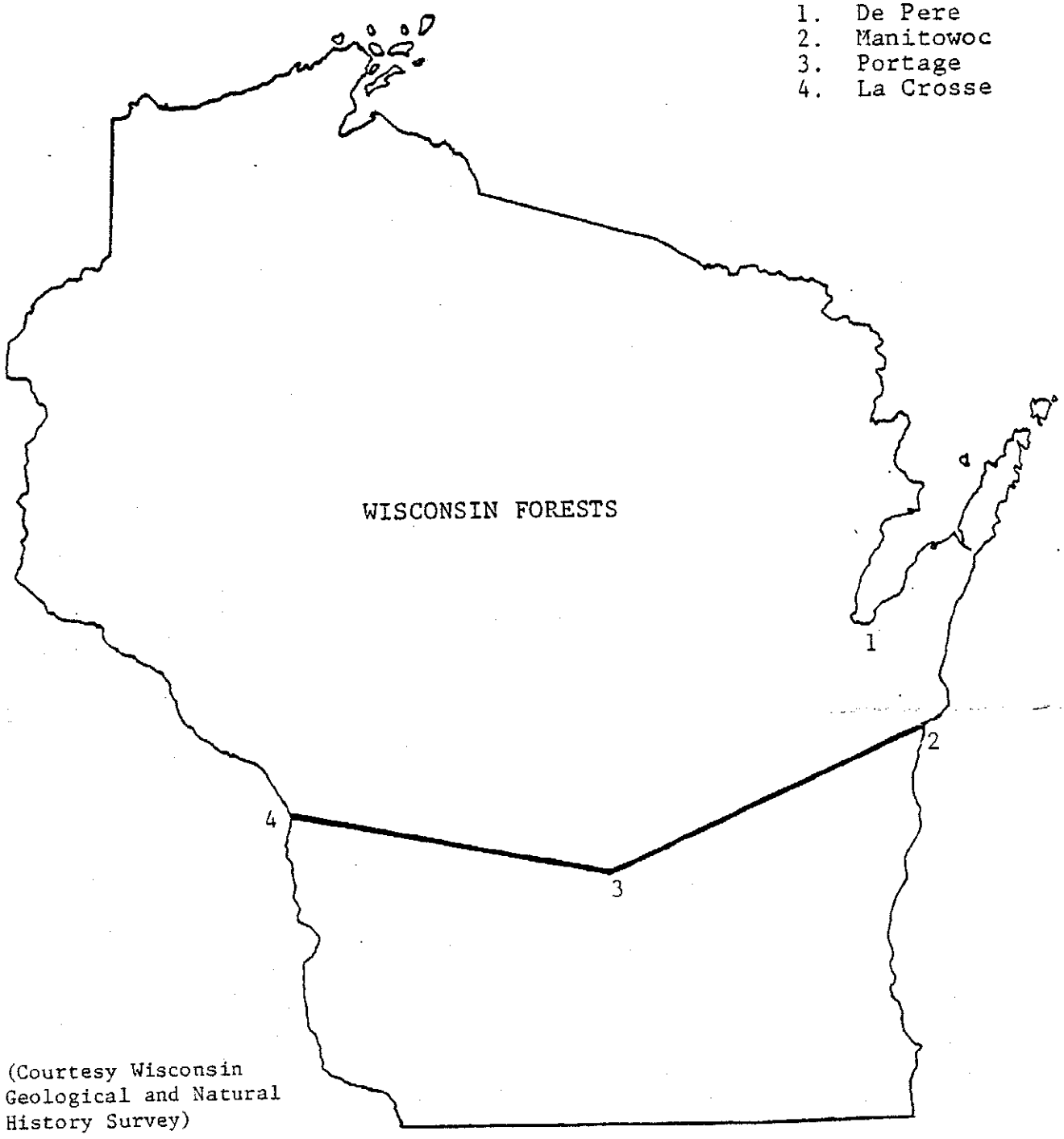
The significance of the logging dam at Round Lake is the role that this structure played in the log driving and log booming stages of Wisconsin lumber history. That history, however, was not just one of various levels of business enterprise. The legend of Paul Bunyan and others reminds us that real people were involved in this industrial process. The lumberjack inspired a folk tradition. The lumberjack was also involved in a folk technology. Dams, such as the one built at Round Lake, were not the result of engineering science. A crucial part of the history of the dam building tradition of the lumber industry comes out of the practical and effective "rule of thumb" experience of generations of lumbermen.

SECTION 1
Northern Wisconsin Background
Technology of Lumbering

Wisconsin's topography was ideally situated to benefit the lumber industry. The Wisconsin forests covered much of the state, existing north of a line delineated by Manitowoc, Portage and La Crosse. Located in the confines of these forests were vast quantities of white pine, the favorite timber of the lumber industry. The glacial age provided easy access to the forests through a system of streams, rivers and lakes that lent themselves well to the transportation and storage of timber. Clearly, Wisconsin was ripe for exploitation in an age of enterprising entrepreneurs.

Although the first lumber mill in Wisconsin was built in 1809 near De Pere, sawmills did not become numerous until the 1840s. The Wisconsin River area was the first to be heavily logged. By 1847 there were twenty-four mills along the river producing 19,500,000 board feet of lumber annually. This grew to forty-seven mills in 1849. Output on the Wisconsin grew to approximately 100,000,000 board feet in 1854, and by 1872 had reached 200,000,000 board feet annually. The Wisconsin River was the most expensive waterway in the state to raft lumber on. The lower river was full of sandbars and the upper river above Portage was plagued by numerous bends and many rocks and rapids. In spite of these difficulties lumber production on this river doubled in a twenty year period.[1]

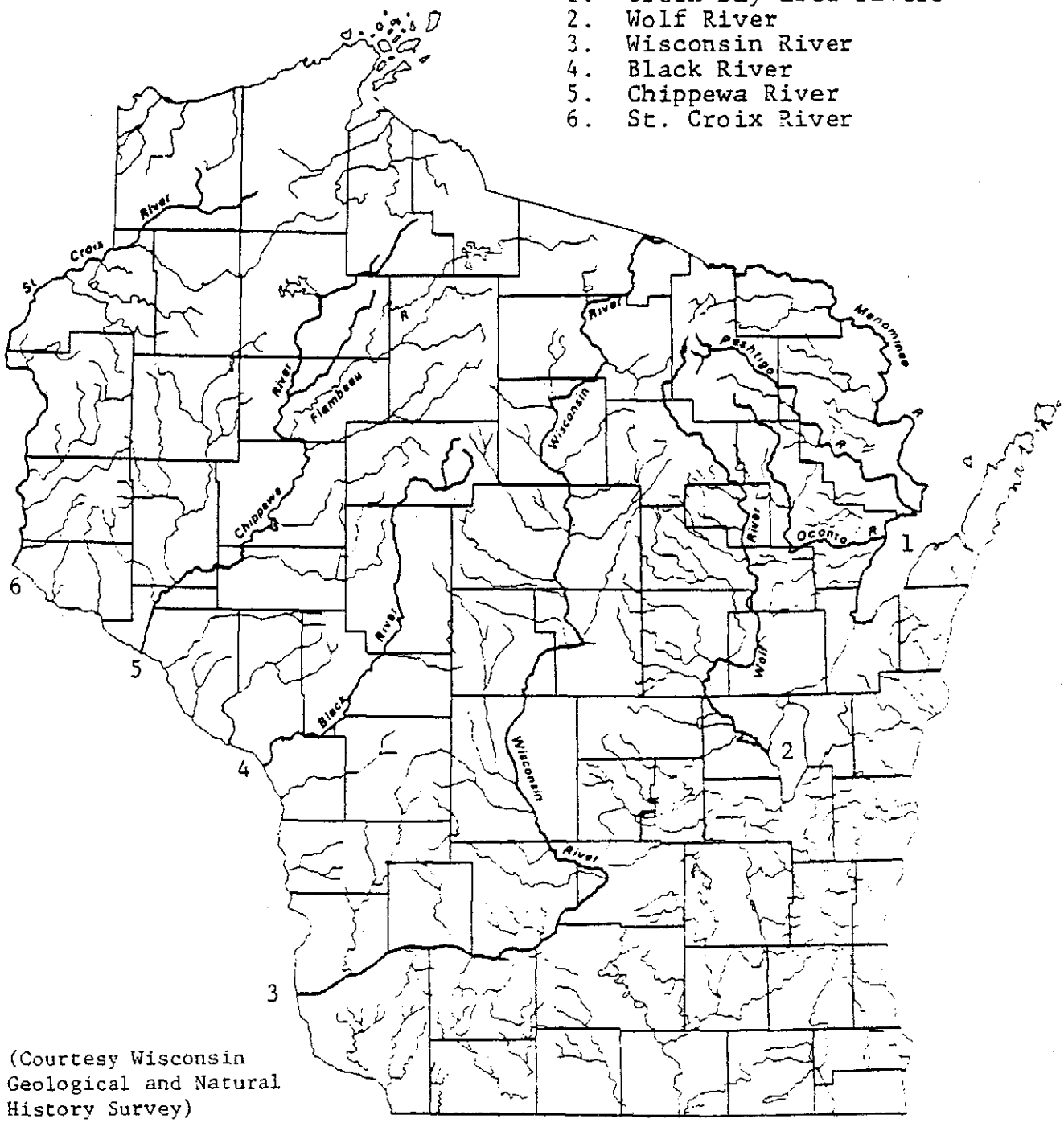
During the 1850s, after the lumber industry had been established on the Wisconsin River, five other regions of the state experienced rapid development. The central watersheds were the Black, the St. Croix, the Wolf, the Chippewa and the rivers around Green Bay. These watersheds either flowed into Lake Michigan or the Mississippi River. Lake Michigan was used essentially by the mills on the Wolf River and Green Bay area supplying lumber for the markets in Milwaukee and Chicago. The western flowages rafted their lumber down the Mississippi River to many markets from La Crosse to St. Louis. This growth of lumber marketing was a result of new sources of capital which allowed local millers to expand through purchases of new land, the acquisition of better equipment and hiring of a larger and more skilled labor force.



(Courtesy Wisconsin Geological and Natural History Survey)

WISCONSIN'S MAJOR LUMBER PRODUCING WATERSHEDS

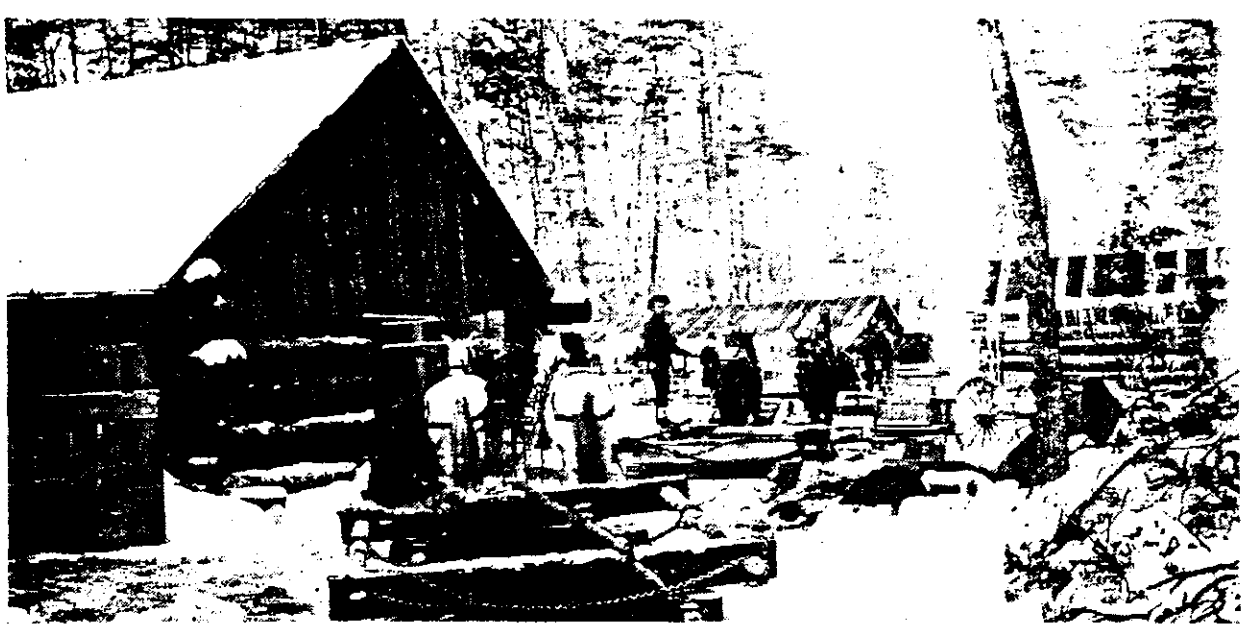
1. Green Bay area rivers
2. Wolf River
3. Wisconsin River
4. Black River
5. Chippewa River
6. St. Croix River



(Courtesy Wisconsin Geological and Natural History Survey)

The lack of clear title to Wisconsin woodlands initially held back investments by outside interests. Up until the 1830s much of Wisconsin still belonged to Indian tribes. This was changed by the Treaties of 1837, when tribal leaders relinquished most of their rights to the land in northern Wisconsin. In the 1840s money began to flow into the state and soon lumbering displaced lead mining and fur trading as important Wisconsin industries. By 1860 the lumber industry was second only to agriculture.[2]

The early phase of lumbering was a complex maze of individual contractors, speculators, loggers, millers, rafters, wholesalers and retailers. Investors bought wood lots and contracted with loggers; millers also bought woodlands or contracted with investors and then negotiated with loggers, rafters and wholesalers. It was not until larger corporations were formed after the Civil War that this complex network of lumbering became a consolidated and much more tightly controlled operation. Most of the cutting of timber was accomplished during the winter. Ice and snow facilitated the transporting of huge logs from the forest to waterways. The process of cutting and removing timber started in September when a camp foreman took a skeleton crew into the woods. They surveyed the best wood stands, laid out main and secondary roads and began building the flooding dams that would move the logs downriver.



A logging camp during its winter operation. (United States Forest Service)

After the ground was frozen additional work crews arrived in camp. The trees were cut by "choppers." The sawyers then removed all branches and cut the trees into twelve to sixteen foot

Choppers and sawyers cut down the trees, remove all branches, and cut them to specified lengths. (State Historical Society of Wisconsin)

lengths. Skidders moved the logs from the point of cutting to the secondary roads where they were positioned on sleds pulled by horses and driven by teamsters. Swampers kept the roads

Skidders move the logs from the site of the cut to the secondary roads where they are put on sleds driven by teamsters. (State Historical Society of Wisconsin - Carr Collection)

in good repair. The loads were banked to await the arrival of the spring thaw. Once on the riverbank the logs were marked to indicate ownership and scaled to judge the quantity of board feet they contained. During the spring thaw the banked logs were rolled into the water where rivermen drove the timbers through the dams to booming areas downstream.

Danger was ever present for the men working in these jobs. The "choppers" and sawyers were often crushed by falling trees. Teamsters had a hazardous duty of guiding heavily loaded sleds downhill. If a load got away on one of the icy

hills, there was no stopping it. The men on the sides of the rivers banked the logs with block and tackle. As the logs moved, men guiding the load were often injured. The rivermen had jobs that depended on sure footing and luck, as the possibility of being crushed was excellent. A lumberjack's job has been highly romanticized, but in reality it was a life and death occupation.

Logs piled on a frozen stream awaiting the spring thaw. (State Historical Society of Wisconsin)

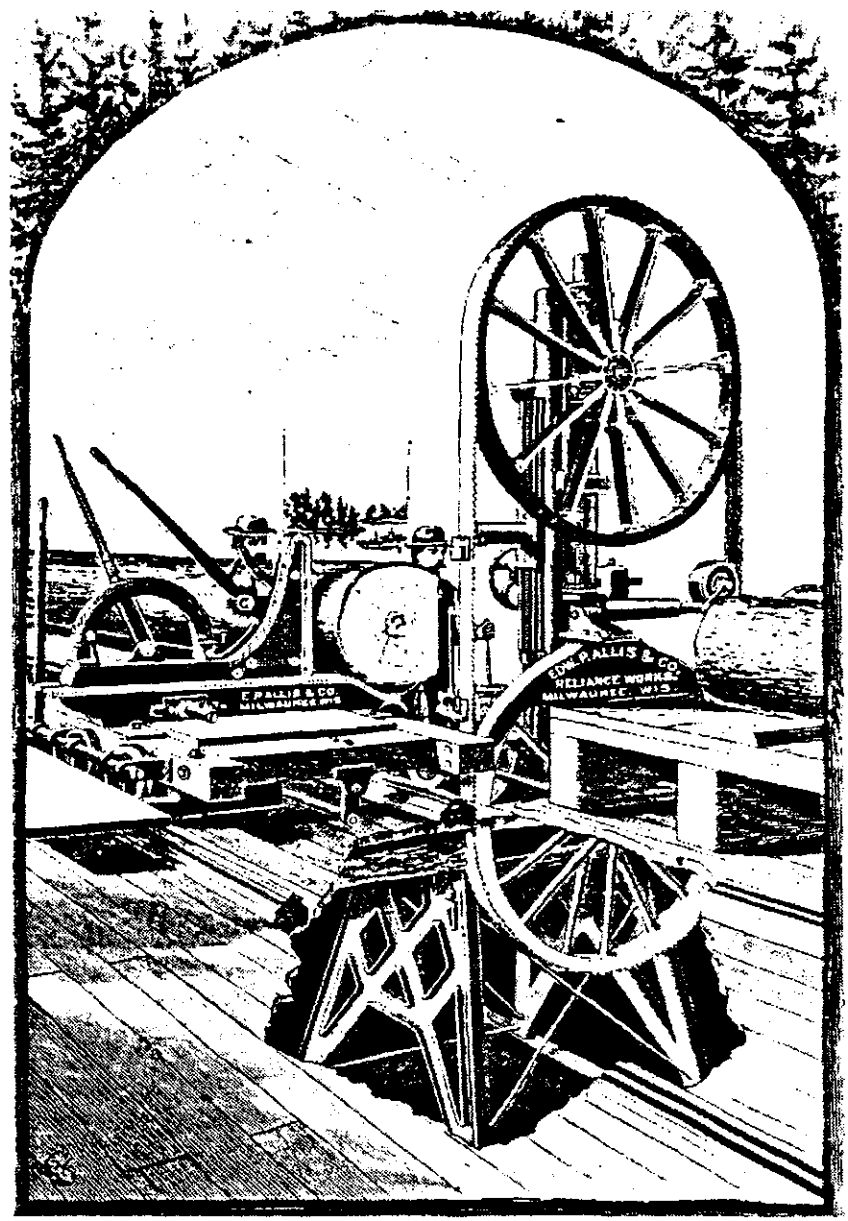
Logs are then driven downstream when spring arrives. (State Historical Society of Wisconsin - United States Forest Service)

Technological change did little to improve the dangerous life of those who worked in the woods. In fact, the technology of cutting trees, dragging them through the forests and rafting them downstream did not change until the railroad entered the forests in the 1870s and 1880s. The only major variation was the substitution of the two-man saw for the ax of the woodman. The biggest technological changes came in the milling, rafting and marketing of logs and lumber.

The two-man saw replaced the ax as the chief means of felling trees. (State Historical Society of Wisconsin)

Initially the sawmills in Wisconsin had been powered by water in picturesque overshot or undershot wheels. These huge wooden water wheels were expensive to make and maintain, and had to be located where a fall of water could be controlled. Two alternatives were introduced after 1860, however, the steam engine and the water turbine. The water turbine did not pose a threat of fire in a mill full of sawdust, and only needed a constant flow of water rather than a waterfall. It was also as efficient as a steam engine, but needed less maintenance. Consequently, Wisconsin millers adopted this new technology and improved the efficiency and speed of their operation.[4]

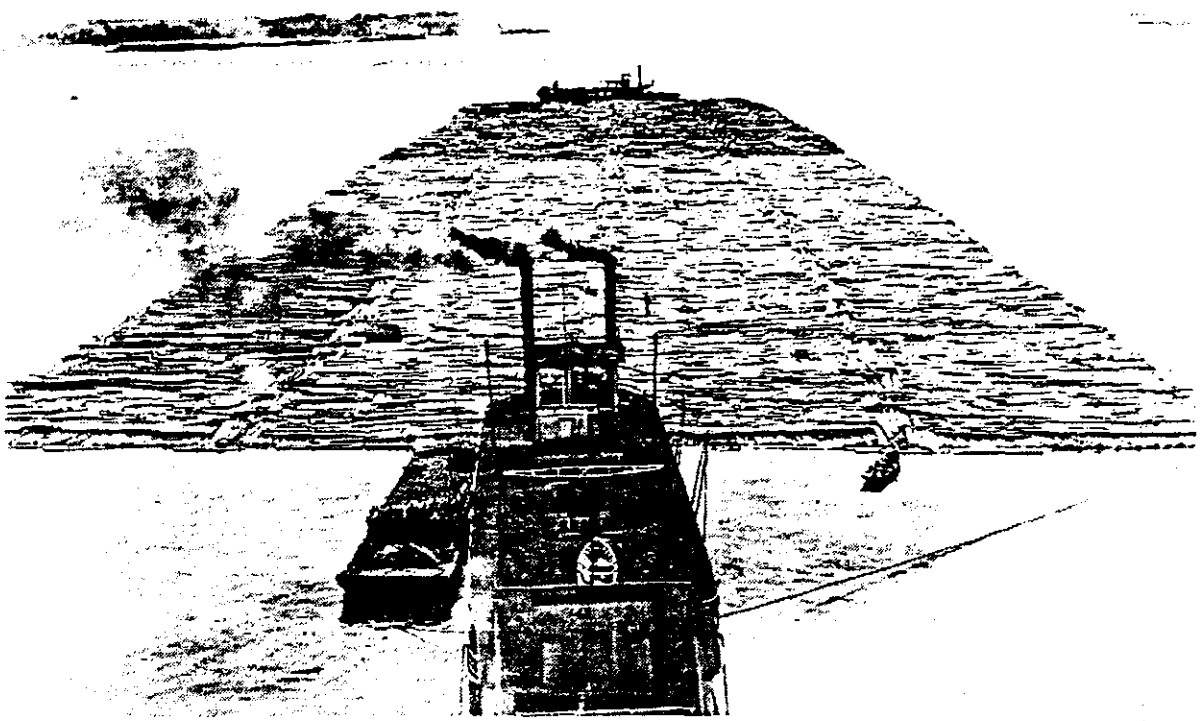
Power sources were not the only changes that affected the sawmilling industry. Modifications also occurred in the sawing process itself. Originally the timber had been cut by hand with a whipsaw. One man stood above the log and another in a pit below. Together, they cut timber into boards. The first type of power saws introduced into mills were variations of this method. In the late 1850s and early 1860s faster rotary saws were introduced. This saw used a rotating circular blade, but made a cut of one-half inch. Speed improved but the process wasted good timber. This was solved in 1872 with the marketing of bandsaws, which minimized waste and yet cut logs with great speed.[5]



A diagram of a bandsaw, the most efficient saw developed for cutting logs into boards. (Allis Chalmers Mfg. Co., Courtesy State Historical Society of Wisconsin)

The transportation of cut lumber was also affected by the concern for efficiency and speed. Binding timbers together to float goods downstream was a common practice. It was adopted by the logging industry as the most efficient and inexpensive method to move boards, shingles and laths from the mills to the markets, despite the constant problems of low water, bridge abutments and dams.

Although the techniques of raft construction were simplified, the biggest change came when steamboats were adopted as the method of propulsion. Early river rafts reached their markets by riding the river currents. Oarsmen were placed on the front and back of the raft to negotiate the curves and bends in the river, as well as other obstacles. This system of raft navigation was greatly improved in 1864, when, for the first time, a steamboat was used to propel a raft on a river. This development made the raft much more maneuverable in addition to enabling rafts to go upstream as well as down. This system was improved further when steamboats were placed at both the bow and stern thereby enabling the raft to negotiate bends and other obstacles. By 1873 there were seventy-three steamboats in use on the upper Mississippi.[6]



Steamboats propel a raft on the Mississippi River. This method of propulsion replaced oarsmen on rafts. (State Historical Society of Wisconsin)

As the technology of raft construction and propulsion grew, so did the size of the river rafts. Before 1860 rafts rarely carried more than 500,000 board feet of lumber. By 1870 raft sizes were nearing 2,500,000 board feet size, and by 1895 rafts were carrying 7,000,000 board feet of lumber.[7]

Between 1870 and 1895, when tremendous changes of scale were occurring in the lumber industry, speculators had already acquired the properties in the upper regions of the six major watersheds. This included the land adjacent to Round Lake on the South Fork of the Flambeau. Thus the logging of this area occurred during a period in which a great emphasis was put on efficiency of operation, technological innovation, coordination of each element within the total system and the expansion of markets.

SECTION 2
Chippewa River Flowage

Frederick Weyerhaeuser observed that "the Chippewa Valley might be called a loggers paradise, a very large part of its area being heavily forested with the finest quality of white pine timber, while rivers, streams and lakes offered a network of excellent transportation facilities."[1]

The Chippewa River Valley was not only the greatest pine producing river valley in Wisconsin, but it had the largest quantity of white pines in the entire Mississippi River flowage. The Chippewa River and its tributaries, the Menomonie (Red Cedar), Eau Claire, Jump, Court Oreilles and the Flambeau Rivers drained 34.1% of the Wisconsin pineries. This drainage figure compared to 21% of the pineries for the Wisconsin River, 13.7% for the St. Croix and 6.8% for the Black River.[2]

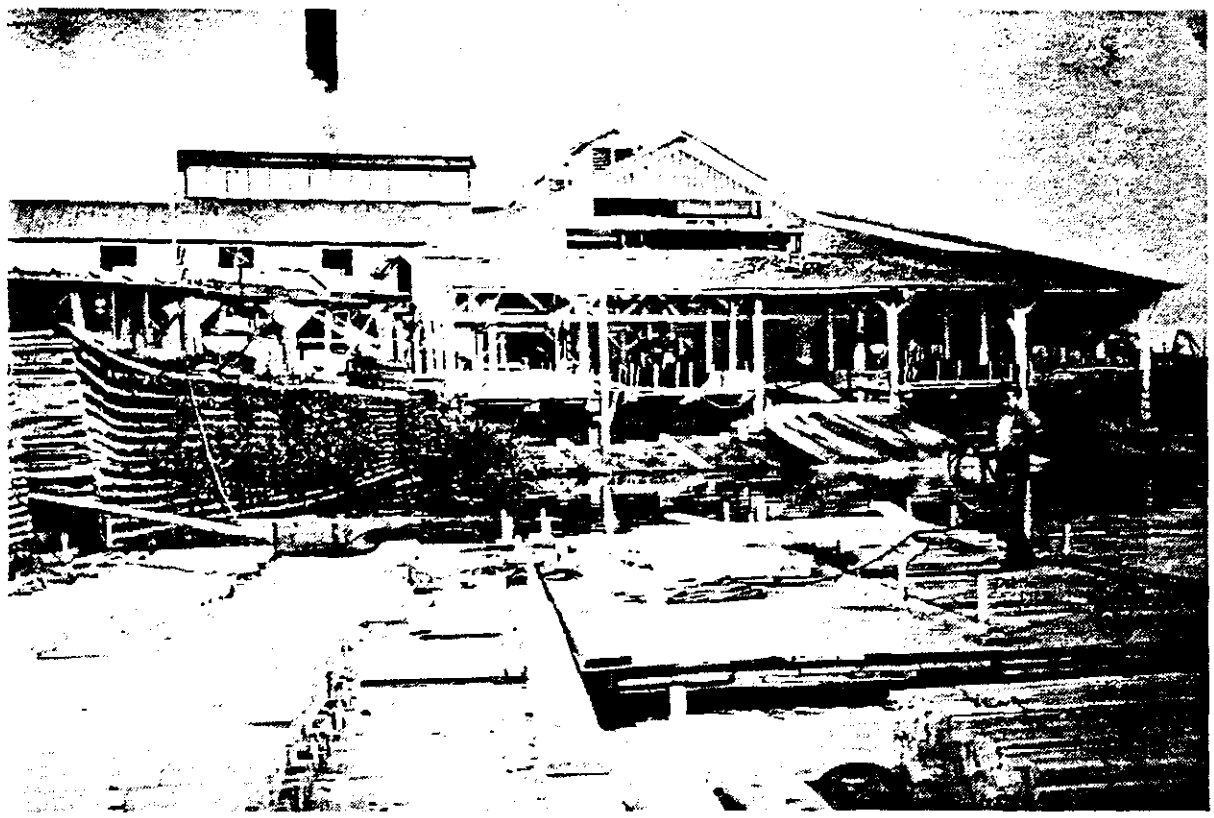
The Flambeau River and its tributaries comprised the main drainage system within the upper portions of the Chippewa flowage. The Flambeau headwaters were 1,600 feet above sea level. The elevation dropped to 1,050 feet above sea level at the junction of the Chippewa and Flambeau, and then continued to drop in the lower portion of the valley to 806 feet above sea level at Chippewa Falls and 665 feet above sea level at the Chippewa's junction with the Mississippi. This ability to drain the forest, as evidenced by the 1,000 foot drop in the valley's elevation, along with the fact that the valley's original timberstand was judged to be about 46,000,000,000 board feet of lumber, did indeed make it the logger's paradise in the eyes of Weyerhaeuser and many others.[3]

Logging in the Chippewa Valley began in 1828 when a mill was built on the Red Cedar River (now the Menomonie), a Chippewa River tributary. A second mill was built in the valley, on the Chippewa itself, in 1830 by James Lockwood. Lockwood, a former trader for John Astor's American Fur Company, it is speculated, may have been the first millowner in the valley to crib and raft lumber to market.[4]

Despite these early starts, the lumber industry did not expand until treaties were made with the Indians. After the treaties of 1837 were signed local lumber companies began to cut pine

in the Chippewa Flowage. Eventually there were twelve major lumber companies: the Knapp, Stout and Company, Ingram, Kennedy and Company, Daniel Shaw Lumber Company, Union Lumber Company, Eau Claire Lumber Company, La Fayette Lumber Company, Badger Lumber Company, Dells Lumber Company, Sherman Lumber Company and the Northwestern Lumber Company. These companies produced 5,500,000 board feet in 1843. Growth was rapid. By 1871 Chippewa Valley mills were providing 436,000,000 board feet of lumber.[5]

Growth did not last forever, however. Production began to decline in the late 1880s and early 1890s. Finally on June 28, 1901, the last lumber raft belonging to the Daniel Shaw Lumber Company left Eau Claire heading down the Chippewa.[6]



A view of the Daniel Shaw Lumber Company, which sent the last lumber raft down the Chippewa in 1901. (State Historical Society of Wisconsin)

The early mills on the Chippewa represented the sawmill stage of development. They cut local timber and retailed lumber in the new communities of western Wisconsin, but soon exhausted these markets. Thus, the Chippewa millowners by the 1850s were involved in the second stage

of development, the rafting of cut lumber. Rafts were sent to lumbering centers on the Mississippi. Nevertheless, the milling industries on the Mississippi wanted more than cut lumber.

Initially the Mississippi River owners obtained their timber from small tracts on the St. Croix, the Black, the Wisconsin and the Chippewa Rivers. This method of scattered acquisition was sufficient, but by the late 1860s the Mississippi owners had increased the capacity of their mills and sought one regular, reliable source from which to draw their timber. It was then that the Mississippi owners turned to the Chippewa.

One of the major proponents for obtaining timber from the Chippewa was Frederick Weyerhaeuser, a German immigrant who arrived in the Mississippi Valley in 1856. Weyerhaeuser toured the Chippewa flowage in 1868, and was greatly impressed with the opportunities that it presented. This enthusiasm was soon transmitted to the other Mississippi Valley owners. This expansion of land acquisition in the Chippewa Valley by the Mississippi rivermen, greatly distressed the Chippewa Valley millowners. They felt that the pineland along the river belonged to them.

A third group also became interested in Chippewa pinelands in the 1860s. They were the land speculators, who were looking for capital investments. They appreciated the conflict occurring between the millowners of the Chippewa and the Mississippi, because it was bound to raise land prices.

The Mississippi owners realized that, if they were to draw large quantities of timber from the Chippewa, a booming area would be required to sort out the logs of the individual operators. Consequently, they decided to construct a sorting works on the Beef Slough, a second mouth of the Chippewa River that entered the Mississippi just north of Alma, Wisconsin. Beef Slough was an excellent site for a sorting works because it had little or no current and was accessible at both ends.

The Chippewa millowners also knew that the Beef Slough would make a good sorting works for the Mississippi owners and took steps to foil these efforts. The first action to keep the Mississippi owners out occurred in 1866 when Knapp, Stout and Company purchased the land around the

north end of the Slough. Later, in 1866, the Chippewa owners obtained a charter for the Chippewa River Improvement Company, a company empowered to construct river improvements on Beef Slough. The Chippewa owners, however, never intended to use those powers, they simply wanted them withheld from the Mississippi owners.[7]

In response, the Mississippi owners incorporated the Beef Slough Manufacturing, Booming, Log Driving and Transportation Company in 1867.[8]

The Chippewa millowners, in turn, built a dam across the north end of the Slough in 1867, which diverted water from the Slough and into the main channel of the Chippewa. The intent behind this improvement, as explained by the Chippewa owners, was to improve navigation on the main stream. The dam did not last long, however, because some Beef Slough employees tore it out in August of that year.[9]

The next phase of this battle was fought in the Wisconsin State Legislature, where the Beef Slough Company attempted to obtain permission to improve the Beef Slough channel. This was debated and voted down numerous times.

Despite its legislative defeats, the Beef Slough Company obtained their power to improve the Slough. With the help of Senator Moses M. Davis,

The Beef Slough sorting works. It was the site of these works that was the center of controversy between Chippewa River millowners and Mississippi River millowners. (State Historical Society of Wisconsin)

a Beef Slough member, a rider was attached to the bill incorporating the Portage City Gas Light Company. This rider provided that when a franchise had been awarded to a group of people, anyone of the individuals included in that group could act on the franchise awarded. With this, James Bacon, one of the original incorporators of the Chippewa River Improvement Company, assigned his rights to the Beef Slough Company.[10]

This victory for the Mississippi owners did not end the matter. The Chippewa owners fought back by obstructing the passage of Beef Slough logs as they came down the Chippewa and its tributaries. This delaying tactic was effective, as only 12,000,000 feet of the 50,000,000 feet of Mississippi Valley owner's timber reached the Slough in 1868.[11]

The Beef Slough Manufacturing, Booming, Log-Driving and Transportation Company had put much time and effort into the battle to improve the Slough. Yet, due to the cost of improvements, the small amounts of timber passing initially, as well as other difficulties, it went bankrupt in 1870. Because the facilities at the Slough were still necessary for the Mississippi owners, Weyerhaeuser, Elijah Swift, and Lorenzo Schricker leased them for five years on November 1, 1870. With this, then, a new organization of Mississippi owners was organized in December, 1870, called the Mississippi River Logging Company. This organization was to protect, collectively, the interests of the Mississippi owners.[12]

Weyerhaeuser was elected president of the Mississippi River Logging Company in 1872. After his election he spent much time in the field obtaining logs for the mills on the Mississippi. During these trips he also surveyed timber land for purchase by the Mississippi River Logging Company. A major break through occurred in 1875 when Weyerhaeuser purchased 50,000 acres of pineland from Cornell University. This purchase represented over 500,000,000 feet of timber as well as a new concept; that of joint acquisition and ownership of timber. This trend continued and by 1879 the Mississippi River firm and its members owned 300,000 acres of pineland.[13]

Throughout the 1870s the Mississippi millowners and the Chippewa millowners worked side by side, though rarely together. Both were by this time in stage three of lumber development, the booming phase. They had achieved a reasonably peaceful coexistence, in fact five Eau Claire firms ran a drive with the Mississippi River Logging Company loggers in 1879, but they never achieved peace. The Weyerhaeuser associates were much larger and more powerful. Two out of every three logs coming out of the Chippewa forests now, were the property of the Mississippi owners. In fact, it was the system of river improvements built by the Weyerhaeuser associates that enabled many of the logs

belonging to the Chippewa concerns to reach their mills.[14]

The event that changed the decade of conflict between local millowners and outsiders occurred in June, 1880, when torrential rains caused severe flooding. Logs on the Chippewa were swept out of their booms and sorting works and sent downriver. Approximately 180,000,000 feet of timber were washed out of the booms, 110,000,000 feet of which belonged to the Chippewa River millowners. Of this 180,000,000 feet less than 50,000,000 reached the Beef Slough, the balance having been thrown along the riverbanks by the raging water.[15]

The 110,000,000 feet represented virtually their whole seasons supply of timber. Chippewa millowners now faced the prospect of a whole season without work or income. A meeting was then held with Frederick Weyerhaeuser and he agreed to a log exchange; for every Chippewa River log that reached Beef Slough Weyerhaeuser gave the Chippewa millowners a Mississippi River log still in the tributaries.[16]

It was through these acts of cooperation by Weyerhaeuser that peace was achieved. Weyerhaeuser's attitude surprised many Chippewa River operators. Roujet D. Marshall, the attorney who negotiated the swap, said:

> The up-river people were surprised by the utter absence, on the part of the down-river parties, of any disposition to selfishly use their position of advantage to drive a hard bargain.... They... resolved that, if the arrangement which had been made should be administered, throughout, with the same spirit of fairness... that they would do all in their power to make an agreement of a permanent character which would render a recurrence of the situation that formerly existed improbable if not impossible.[17]

Permanent peace was achieved in November, 1880, resulting in the formal organization of the Chippewa River Logging Company in June, 1881.[18]

The establishment of the Chippewa River Logging Company, and the Chippewa Pool, created the machinery necessary for the rapid logging of the remainder of the Chippewa flowage forests. The Pool was owned by the Chippewa millowners and the Mississippi millowners in a 35% to 65% stock split. The Mississippi owners retained control over the organization, which was responsible for the timber acquisition, transportation and

distribution of logs to all members. The Pool now controlled all aspects of logging for most millowners in the Chippewa Valley as well as the Mississippi Valley.[19]

The Pool was a success, especially when reviewing its capability to acquire forest land, as well as its efforts to improve the streams and rivers and the boom sorting works it maintained. Chippewa Valley output continued to grow as a result of these efforts, until 1884 when it peaked at 741,837,000 feet of timber in a season.[20]

The Chippewa Valley owners and the Mississippi Valley owners would not have been so enthusiastic about expanding their operations had not they had an immense market for their finished lumber. As more finished lumber was sent down the Mississippi, the major millowners in both river valleys began to open up retail yards in the river towns. This system eliminated selling to a wholesaler and increased the millowners control over the entire operation. The operation of retail yards was aided immensely by ample railroad connections to all parts of the country. Laird-Norton of Winona, Minnesota, for example, had twenty-seven retail yards in 1880 which increased to thirty-five in 1885. These yards were located along the Chicago and Northwestern Railroad tracks and extended into the Dakotas.[21]

To meet the demands created by these new markets, however, more timberland had to be purchased in the Chippewa Valley by the Pool. When the Pool was organized Weyerhaeuser insisted on, and received freedom to negotiate land sales for the organization. He turned his efforts to one of the last large holders of northern Wisconsin pineland, Cornell University of Ithaca, New York.

Cornell University was able to achieve such a prominent position in Wisconsin pineland ownership as a result of the Morrill Land Grant Act. The bill, passed by Congress in July, 1862, was designed to provide financial support for colleges of agriculture, mechanical arts and military science.[22] Through this legislation states were awarded land from the federal domain in the form of scrip, the amount being dependent on the size of a state's congressional delegation. The states were then to be able to sell the land, the income from which was to go to support the qualifying agricultural and mechanical (A&M) college in the state.

The State of New York received 989,920 acres of land in this program. Initially, there were two schools that wanted to benefit from the scrip. These were People's College and Agricultural College, but neither could obtain the necessary financial support to qualify for the aid. Subsequently, Ezra Cornell, a native of Ithaca, New York, saw an opportunity to take advantage of the scrip program and he founded Cornell University with an endowment of $500,000.[23]

Cornell first proposed a plan whereby the State would turn the scrip over to him. He would then buy land in the west, let it appreciate and then sell it to benefit the University. Neither the State nor the University trustees went along with this. Cornell next proposed to buy scrip from the State and manage it out of his own resources until it could be sold. He then agreed to turn all proceeds over to the University above his costs and 7% interest for the use of his funds. The State agreed to this plan.[24]

Cornell enlisted the aid of a friend, William C. Woodward, to assist him in deciding where to purchase the lands. Woodward recommended Wisconsin, with the plan to use Henry C. Putnam of Eau Claire as his agent. The lumbermen of the Chippewa took a dim view of the outside speculators. The position of the Chippewa lumbermen was set forth on November 23, 1876, in a letter from Putnam to J. W. Williams of Cornell University:

> The Law giving the scrip is looked upon as a fraud upon the Nation and the people in as much as it was conceived in the minds of a few Land Sharks and some Members of Congress in the Eastern States who found they could make use of the popular ideas which seemed to favor the Cause of Education and thus set the Scrip afloat in such quantities that it could sell for a Song and thus enable these Sharks to buy up immense tracts of prairie and other Lands which today is retarding the settlement of the country.[25]

Despite these ill feelings towards outside speculators, Cornell decided to use the vast majority of his scrip to purchase northern Wisconsin pineland, using Henry C. Putnam of the Eau Claire land office as agent. Henry Putnam was a unique man, well suited to the task of aiding speculators who wanted land in the Chippewa Valley. Putnam ran the Eau Claire land office from 1864 to 1872. Although he was officially no more than the clerk, he knew the operation of the office as

well as the land of the valley. Nothing could happen in the land office without his consent. Paul W. Gates, in his book the Wisconsin Pine Lands of Cornell University, noted that "no man in Wisconsin could better serve capitalists and lumbermen in securing choice pine land than he, not only because he was thoroughly familiar with the Chippewa Valley, but also because he controlled the plats and the entry books in the Eau Claire office, ..."[26]

To select the pineland that would monopolize Chippewa timber holdings for Cornell, Putnam employed timber cruisers on the Chippewa, the Flambeau, the Jump, the Thornapple and the Menomonie (Red Cedar) Rivers. Putnam, with his complete control of the Eau Claire office, was able to keep all land from being entered until he knew whether or not Cornell wanted it. Some of the land he purchased on November 24,1863, was on the South Fork of the Flambeau and included the future site of the Round Lake logging dam.[27] By 1867 Putnam had entered 499,126 acres of pineland for Cornell, and then he became involved in land management for the college.[28]

Property management in Wisconsin was hindered by timber thieves, by the assessment and methods of paying taxes, and the varying means by which land could be sold, contracted, logged or subdivided.[29]

By the end of 1871 about half of Cornell's Wisconsin lands had been sold for $1,100,000. Three years later Cornell turned the remainder of the land over to the University. Consequently, on October 13, 1874, the land adjacent to the Round Lake logging dam was transferred to Cornell University.[30]

As a result of this title transfer the University appointed Henry W. Sage and John McGraw as Cornell land managers. Sage and McGraw were effective managers. They watched closely the fluctuating price of timber on the Chippewa flowage.[31]

During the 1870s available pine stands became scarce in the Chippewa Valley. Consequently, Weyerhaeuser contacted Cornell University when he needed more pineland and worked out a purchase agreement. The Chippewa Pool bought 109,601 acres of land from Cornell at a cost of $16.80 an acre in 1882. Three years later the Round Lake property became part of the Weyerhaeuser monopoly.[32]

The Cornell presence in northern Wisconsin ended in 1925 when the final parcels of land were sold.

However, most of the land was sold by 1906. Cornell had paid sixty cents an acre for the scrip, or a total of $309,200. After all expenses were deducted, Cornell University netted a $5,000,000 profit; almost all of it coming from land sales in the Chippewa Valley.[33]

Cornell University is today one of the leading schools of the nation. Part of that success comes from the shrewd investment in the rich pine forests around Round Lake. By the time that the lumber pool formed by Weyerhaeuser purchased the land from Cornell, the logging and lumbering industry was a powerful and well organized institution. The monopoly they developed made them absolute lords over the rivers, lakes and streams of the Chippewa flowage.

SECTION 3
Riverdriving

Riverdriving, the act of removing timber from the forests and sending it to the mills, became a necessity in the stage two and three levels of development in Wisconsin's lumber industry. There were several conditions that had to be present on a river or stream, however, before log drives could be handled successfully. The first element was a sufficient water supply. The streams also had to be wide enough to handle logs in sharp turns, thereby avoiding log jams. In addition it was preferable to have sharply pitched banks along the rivers to keep the water and logs out of adjoining marshes and swamps. All of these conditions also aided in providing for a good current. There also had to be an adequate supply of floatable timber. Hardwoods did not float. Consequently, the cutting of hardwoods depended on railroads and later trucks.[1]

When these conditions were met, log driving became an extremely inexpensive way to get the timber from the forests and to the mills. The basic carrier was free and the equipment was minimal.[2] The major investment was in labor.

Log drivers moved the cut timber from the forest to the mill. (United States Forest Service)

Log driving, nevertheless, had its disadvantages. A major problem was keeping track of the logs. Despite the best efforts of the drivers, logs could be strewn along the riverbanks, or caught in backwater pools. In addition, driving costs varied greatly, depending on the weather. Little snow or rain meant extra work to clear rapids and stretches of low water.[3]

To try and offset some of the disadvantages the lumbermen built "flash" or "splash" dams. These dams held back small streams and released water into the channel during a log drive. Building revetments, or the shoring up of the riverbank, was also necessary to minimize the loss of logs and water. Loggers also cleared sunken objects, boulders and overhanging trees from the waterway, in addition to building booms and holding areas to facilitate log sorting.[4]

Splash dams frequently provided the impetus necessary to drive logs in less than favorable circumstances. (State Historical Society of Wisconsin)

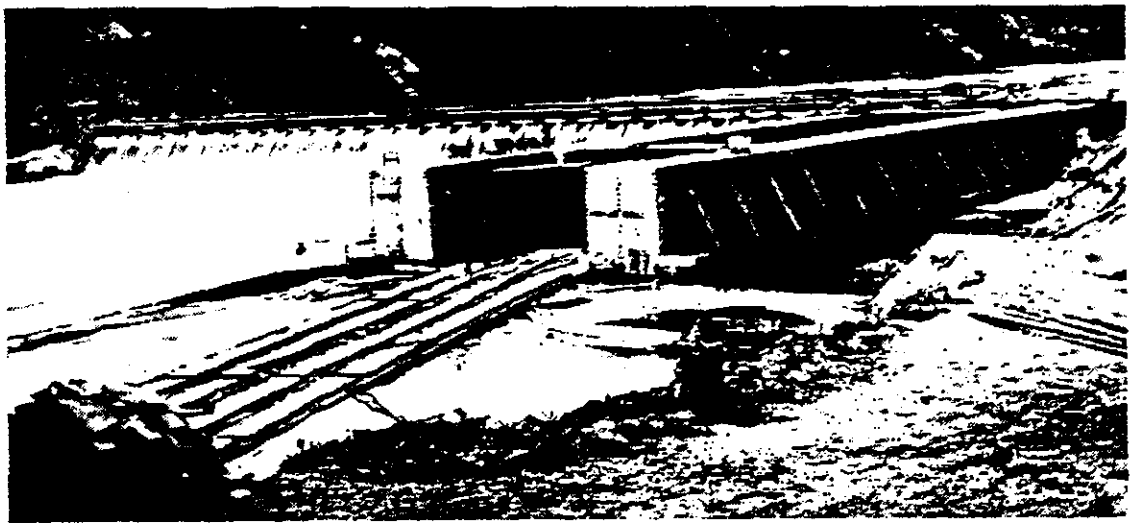
Prior to making these improvements on the waterways, there was the matter of state and federal law. The first law that affected Wisconsin's waterways was the Northwest Ordinance of 1787. It stated that "all navigable waters leading into the Mississippi and the St. Lawrence were common highways and to be free forever."[5]

The Territorial Legislature of Wisconsin, however, modified the original statement somewhat, when it passed the Mill Dam Act of 1840. The Act stated that dams could be built without permission, if they were built on non-navigable streams. Navigability, for the purpose of this act, was to be determined by the streams ability to float and carry a saw log. This Act, nevertheless, was abused frequently by those who built dams on navigable streams without pursuing the saw log test.[6]

When Wisconsin's Constitution was ratified in 1848, there were provisions included that attempted to insure free passage on all navigable streams and

rivers. Specifically, the Constitution said that the Legislature had to authorize the damming of all navigable streams. This authorization, however, was easy to obtain, especially as lumbering took a leading role in Wisconsin's economy.[7]

One of the first major improvements built in the Chippewa watershed was the Eau Claire Dells. The bill authorizing this work was passed by the legislature in 1876 and allowed a dam and log sorting works to be built on the Chippewa River between Eau Claire and Chippewa Falls. Eau Claire lumbermen contended that they needed an area to sort and hold logs destined for their mills. On the other hand it was fought by the Chippewa Falls lumbermen who argued that it would be an obstruction as they attempted to send their finished lumber to market. This event was one of many conflicts on river use by loggers and navigation concerns.[8]



The dam and lock at the Eau Claire Dells. (State Historical Society of Wisconsin)

The purposes of driving dams according to a study entitled River Drive of Pulpwood: Efficiency of Technique, are:

1. To create a reservoir of water with which to prolong the duration of the drive period.

2. To regulate the run-off, keeping the level of the water in a stream at a more or less constant level.

3. To accumulate sufficient water to enable an operator to drive a small, rough creek which otherwise could not be driven.

4. To collect and conserve water at intermediate points, especially when the drive is long, so

that fresh impetus may be given, or so that deadwaters, rapids or bad turns may be more easily negotiated.

5. To raise the water level of a rough, difficult stretch of stream.

6. To increase the carrying capacity of a drivable stream, thus increasing the possible annual cut on the watershed and reducing the total years of operation necessary to complete the area.

7. To create, or enlarge, landing space [of bodies of water upon which the cut timber could be placed.][9]

This publication also lists several disadvantages of driving dams:

1. The natural current of a stream is interrupted, and any drive which must pass through a dam or dams is therefore considerably slower.

2. Pulpwood must be sluiced through dams, and thus the drive costs are increased.

3. Dam guardians must be kept on each dam at additional expense.

4. The ice on dam storage areas tends to break up later than on the rest of the stream....

5. Flooded shorelines must be cleaned off, or boomed to prevent excessive sweep costs.

6. It is often necessary to build expensive stretches of fill to prevent water escaping through low places in the storage area contour.

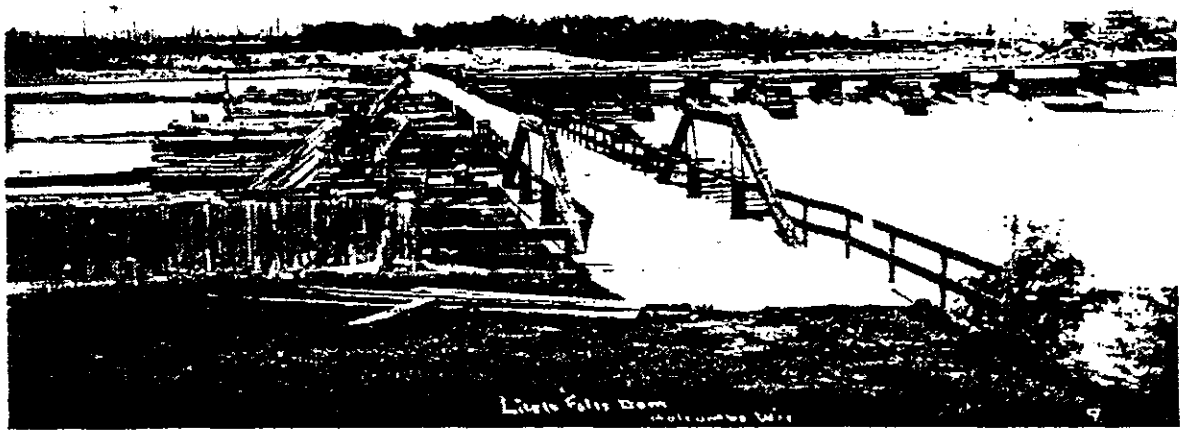
7. Contrary winds have much more effect on pulpwood floating on exposed dam storage areas.[10]

As the Chippewa lumber industry pushed further into the headwaters, the difficulties of controlling adequate heads of water became greater. The Chippewa Valley was very susceptible to low water following winters of minimal snowfalls. To alleviate this hazard, Weyerhaeuser envisioned a series of dams and improvements in the valley which could get timber out of the forest during poor driving conditions. He applied to the federal government for aid in financing these improvements, but he was turned down. It was in response to that refusal that, in 1876, Weyerhaeuser established the Chippewa

River Improvement and Log Driving Company, a company to build and maintain improvements on the waterways, as well as to do the actual log driving. Ultimately, this company was responsible for the maintenance of one hundred forty-eight dams in the valley.[11]

The first major improvement built by the Chippewa River Improvement and Log Driving Company was a dam at Little Falls, about thirty miles up the Chippewa River from Chippewa Falls. For several years low water in the river had stranded many of the Mississippi River Logging Company's logs in the upper half of the Chippewa. In 1876, 154,141,000 board feet of timber reached Beef Slough. This figure dropped to 82,658,000 in 1877 and then raised slightly to 91,873,000 board feet in 1878, still far below the 1876 figure. There was clearly a need to provide some means to improve the passage of logs downriver.[12]

The Little Falls dam was built in 1878 by Elijah Swift of Eau Claire and Joseph Viles of Chippewa Falls. The dam was of great size for this period being 625 feet long and sixteen feet high. It had thirty-two flood gates that were seven feet wide by seventeen feet high. The dam was capable of creating a reservoir ten miles upriver and, when open, could raise the water level three feet at Beef Slough one hundred miles away.[13]



The Little Falls dam at Holcombe, Wisconsin. (State Historical Society of Wisconsin)

After having been in operation only two years the wings of the Little Falls dam were washed out in the floods of 1880. It was rebuilt by Swift and Viles only to be washed out again in 1884. This time Billy "The Beaver" England, a well known "folk technologist" who specialized in logging dams, was secured to rebuild the dam.

Captain Charles H. Henry, originally with the

Orrin Ingram firm, was at this time the supervisor of all the upriver logging and driving operations for Weyerhaeuser Pool. He also oversaw dam construction and rebuilding, and it was he who recommended England for the 1884 Little Falls rebuilding job. Henry related the incident in a newspaper article dated March 9, 1916:

> Soon after the dam went out this time, Mr. Weyerhaeuser called me to his office in Chippewa Falls and asked 'who is the best dam builder on the Chippewa?' The answer was Billie[sic] England, The Beaver, who has never lost a dam. We, Mr. Weyerhaeuser, Mr. England, and myself drove to Little Falls, measured, made soundings, and agreed that the wings should be built as they were, and now -31 years later- the wings of the Holcombe dam stand practically as Mr. England left them in the spring of 1885, he having worked a large crew of men during the fall and a very cold winter.[14]

England was very active as a dam builder in the Chippewa Valley. He built the Bear River dam in the Lac du Flambeau Indian Reservation as well as the Squaw Lake dam, the Sugarbush dam on the South Fork of the Flambeau, two dams on the West Fork of the Chippewa, the Manitowish dam on the Manitowish River and many more.[15]

By 1878 there were enough dams and other river improvements that the Eau Claire correspondent for the Northwestern Lumberman felt that there was no reason for logs not to reach their intended mills. Improvements such as the Little Falls dam, dams on the Upper and Lower Elk, a dam on the South Fork of the Flambeau, as well as dams on the East Fork of the Chippewa and Rice Creek were cited as the cause for this optimism.[16]

The Northwestern Lumberman did not stop at mild statements of optimism about what these improvements could mean; rather they came out with an editorial hailing the improvements and what they meant to the millowners. Said the Lumberman of these improvements: "It will hardly be possible again to leave 300,000,000 feet of logs back in the tributaries of the Chippewa,...." The paper continued:

> The changes made by these improvements, assuming, of course that they are as successful as they promise to be, is one which practically assumes ample stock of logs and lumber for the Mississippi Valley every year. Hereafter it will be only necessary to know the amount of logs banked to be

> able to tell very closely the stock that will be available for the ensuing season. Once safely in the river logs may be counted upon to reach the mills in regular course, whatever may be the stage of water upon which they are driven. The surplus stored up in the immense reservoirs which have been provided will be called into requisition, and the logs floated from one dam to another until they are brought into safe water. The old possibility of a part or the whole of the log crop hanging up altogether has passed away, probably forever, and with it has gone much of the uncertainty which has made the result of each season's work such important matter for the trade. The Mississippi operators may rest quietly now in the knowledge that no freak of nature is going to deprive them of their in alienable right to run their mills from May to December....[17]

The South Fork of the Flambeau River, the Flambeau River being the main tributary to the Chippewa in the upper Chippewa Valley, was logged throughout this period of riverdriving and river improvements. The South Fork was sixty-five miles long, originating at the mouth of Round Lake on the Pike Lake chain, and meeting the North Fork at Manitowish, near Big Falls.[18]

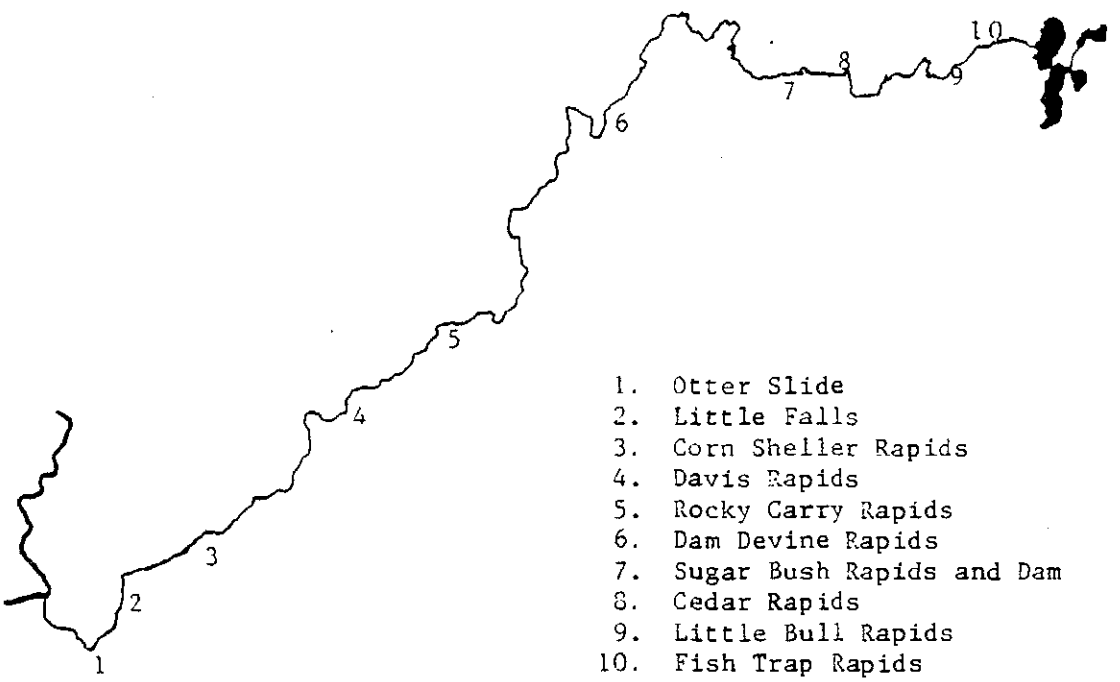
The region was initially logged by Weyerhaeuser concerns as well as others; all had camps along the river. In addition, the area around Round Lake and Pike Lake were also logged. The camps along the river had the advantage of being able to bank the logs, ready to send them on their way downriver when the spring thaw came. This was not a luxury that many of the camps on Round Lake and Pike Lake had, however. They had to get their cut timber across the lakes to the mouth of the South Fork where the logs would begin their downriver trip. For this purpose the Chippewa Pool operated a steam tugboat on the lakes.

The South Fork could be driven with a minimal amount of difficulty, especially as the improvements were built. Captain Henry described the South Fork, naming the rapids that presented difficulties for driving, in a letter dated May 18, 1928. The rapids described follow an upstream path towards Round Lake:

> The first rapids named above the mouth of the South Fork of the Flambeau... is the Otter Slide. The next is Little Falls, a very rough piece of water. Just above that falls is a long stretch of Bergeron Rapids.... About five miles above that, is the Corn Sheller Rapids. The next a

short rapids... named for W. L. Price. The first rapids to speak of above the mouth of the Elk River, on the South Fork of the Flambeau, are the Davis Rapids, named for our Henry D, Davis, who logged that vicinity in an early day. The next is Rock Carry Rapids.... There are a few unnamed rapids between the rapids and Fifield, where the old Wisconsin Central Ry. crossed the South Fork of the Flambeau. The Crogstead Rapids are a short distance above Fifield. The next are Dam Devine Rapids. A few miles above there is the Sugar Bush [sic] Rapids, where we built a flooding dam, at the head of that dam are the Cedar Rapids, at the head of which, Roy Herrick had logging camps, that he occupied a number of winters for Smith and Herrick, and Mr. Peter Truax. The next rapids are where the Chippewa Logging Company had a camp for several winters, John Whidden as foreman, Little Bull Rapids. The next are the Fishtrap Rapids 2½ miles below the Pike Lake [Round Lake] flooding dam. There were no rapids to speak of above the Pike Lake, on Squaw Creek and Rice Creek.[19]

SOUTH FORK OF THE FLAMBEAU RIVER



1. Otter Slide
2. Little Falls
3. Corn Sheller Rapids
4. Davis Rapids
5. Rocky Carry Rapids
6. Dam Devine Rapids
7. Sugar Bush Rapids and Dam
8. Cedar Rapids
9. Little Bull Rapids
10. Fish Trap Rapids

The South Fork was logged heavily, as well as its tributaries, Skinner Creek, Price Creek, the Elk River and its tributaries, Sailor Creek, Hay Creek and Squaw Creek. For this reason, to get all of the timber cut along these waters out of the forest, it was imperative that improvements be made to circumvent all the rapids and hazards that Captain Henry named. Among the improvements were driving dams at Sugarbush and at the mouth of Round Lake.

SECTION 4
Driving Dams

Driving dams were designed and built to take the best advantage of the materials that were found in the areas in which they were built. It was difficult enough transporting regular supplies to upriver camps, much less materials to build a dam. In Wisconsin this meant that driving dams were usually built of a combination of logs, hewn timber, rocks or earth. These dams were not designed or built by engineers. Instead they were constructed by knowledgeable loggers and woodsmen who developed their expertise from experience and precedence.

Driving dams were not all built the same way. The most permanent of these dams, as well as the most expensive, was the crib dam. The crib dam was built in such a fashion that the logs framing the wings resembled a baby crib. The crib was then filled with rocks, stones or earth. This was a reasonably durable structure with a life expectancy in excess of eight years. It also rarely failed, but when it did it usually affected only a small, easily replaceable portion of the dam. The crib dam was a good dam for holding large heads of water. The crib dam, nevertheless, also had its disadvantages. The major drawback was the expense of excavating and hauling the rock and stone fill to the site.

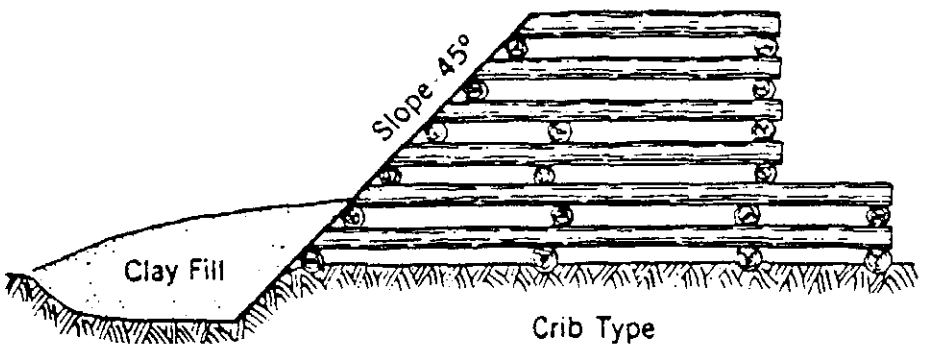


Diagram of a crib dam, the most permanent yet expensive type of driving dam. (Logging - Transportation, courtesy John Wiley and Sons, New York)

Another type of dam commonly used for driving was a rafter dam. Rafter dams were much less expensive than crib dams because they were "self-loading;" that is the weight of the water against a sloped face held the dam in place, it did not need expensive fill. The rafter dam had a crisscross structure that was angled upstream. Its upriver

face was planked and caulked and had a slope just exceeding thirty-three degrees.

Despite the advantage of a lower cost on this type of dam, the rafter dam only had a life expectancy of two to five years. Therefore, it could only be used in areas where the logging operations were not expected to take an excessive length of time. This was a low head dam, and consequently, could not retain the amount of water of a crib dam.[2]

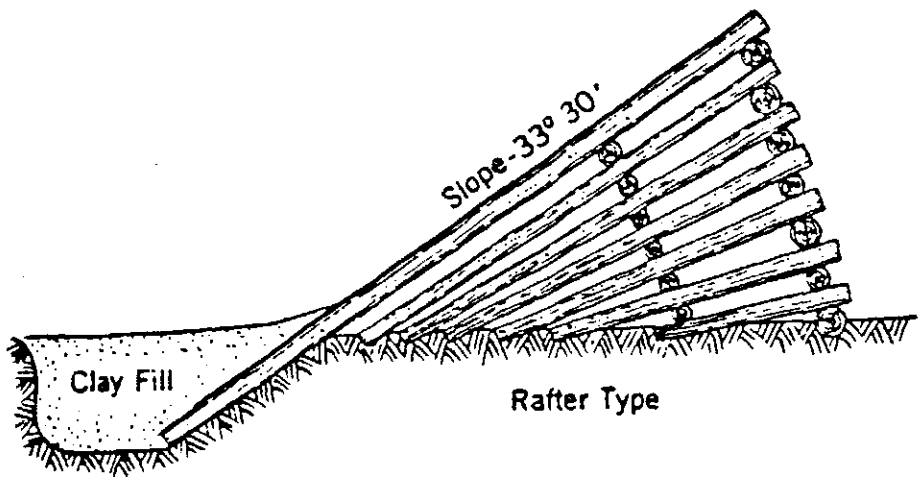


Diagram of a rafter dam, a less expensive, shorter lived dam. (Logging - Transportation, courtesy John Wiley and Sons, New York)

A third type of dam frequently used for driving was a post dam. This dam is so named because it used log posts for support instead of timber frames. For the post dam a row of logs was laid lengthwise across the river bottom, with posts anchored in an upright position at regular intervals. Stringers were then run along the tops of these posts, with one end of the dam facing being affixed to the stringers, and the other end being anchored into the upstream riverbed. The dam was "self-loading," but there was no other support under the facing. This gave it a very short life expectancy, only two to three years, but it was an efficient dam for use in upper tributaries that would be cut out in only a season or two. The facing on post dams also had a slope of just more than thirty-three degrees, thereby making it a low head dam along with the rafter dam.[3]

Other types of dams often used for riverdriving were brush and stone dams and earthen dams. Brush and stone dams consisted of logs that were laid across a river and piled high with brush. This combination was then strengthened and compressed by laying heavy boulders on top of the pile and covering the whole structure with smaller

rocks, sand and gravel.[4]

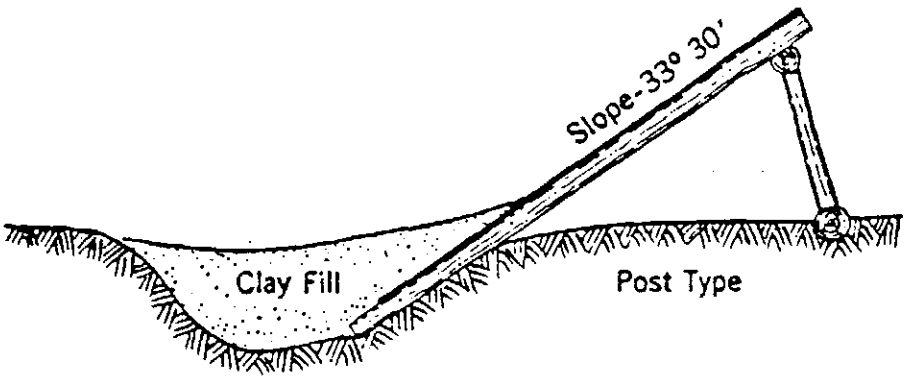


Diagram of a post dam, the least permanent type of driving dam. (Logging - Transportation, courtesy John Wiley and Sons, New York)

Earthen dams were built simply by constructing an embankment of earth across the stream or river to be dammed. They could be easily overtopped or eroded and had a short life span. The key to the longevity of this dam was the type of soil available.[5] Soil with a substantial clay content was best.

There were several factors that could jeopardize the longevity of a driving dam. The two major problems, however, were sliding and overturning, both caused as a result of undermining by the infiltration of water under the dam. An effective way to minimize the seepage was to carefully select the site for a dam. Site selection also depended on a sufficient estimate of timber to be logged and an adequate area to impound the water which would be used for driving. But the crucial factor was a good foundation in order to minimize the hazards of undermining. Solid rock portions of the riverbed were best, because the dam's base timbers could be bolted directly to the rock. Therefore, any portion of the river that met the initial criteria and had a rock bottom, qualified as a good choice selection.[6]

Where rock bottoms were not available in the location of a dam, other considerations were made to avoid undermining. In his study Construction of Timber Dams, J. A. Henderson advised:

> The best method to prevent undermining is to select the dam site at a point where the riverbed and banks are of good material and not subject to scour. Further, I would say to build the dam at some point where the river or creek flows in a straight line. Throughout a straight section the river current is uniform. At a bend

> the current is affected by topography as the bend in the river will cause velocity to increase on the concave side and decrease on the convex side. The decreases in velocity on one side tends to cause a deposit of some of the materials in suspension while the increase in velocity, on the other hand, tends to provide scour.[7]

Another consideration in dam site selection was to have a location where the dam can discharge most of its impounded water. This meant for instance, that a dam located in the outlet of a lake may have to be placed slightly downstream instead of at the outlet itself.

As the structure of the dam was built on the foundation, another factor came into play which affected the dam's ability to resist undermining. This factor was the dam's toeing. The "toeing-trench" was dug immediately in front of the dam, on the upriver side. Then as the facing for the dam was being laid on the structure itself, it was extended down past the river bottom into the trench. The trench was then filled with ballast which was usually either clay or gravel. The purpose of the ballast was to sink the facing far enough into the bed to catch most of the seepage, or at least obstruct it so much that the water had no force and could not move the surrounding earth.[8]

Leakage on or around the embankments of the dam could also cause severe problems. This was controlled, nevertheless, by building the dam into the embankments. Abutments were then built to protect the embankments, being high enough to avoid being topped by high water.[9]

Another very important part of driving dam construction was the inclusion of sluiceways and aprons. These were wooden or timber portions of the structure that carried the water and driven timber farther downstream. This was necessary to protect the foundation on the downstream side, just as toeing was on the upstream side, because undermining was still a concern.[10]

In order to function as driving dams, these dams needed gates through which the timber could be sluiced. Regardless of what the structure of the dam was composed of, the gates and their framing were built of hewn timber or logs. In many instances this portion of the dam was anchored to a foundation of heavy timbers that were placed across the river and buried in the embankment on either side. Upright posts were then mortised into these timbers and the gate frame was

completed. The timbers used in these frames were usually eight inches or larger, and were also held together with one-half inch to five-eighths inch drift bolts that were ten or more inches long.[11]

The gate portion of driving dams were usually located in the middle of the structure, because that is where the greatest depth and flow of water occurred. Typically gates were hand operated, yet they consisted of many types. Three of the more commonly used types, however, were the horizontal drop log, the vertical drop log and the one piece solid gate.[12]

The horizontal drop log gate operated within a framework consisting of upright timbers that were constructed with slots into which the gate logs dropped. These gates were operated by means of a roller placed above the slots with chains and hooks attached to it. The hooks could then be dropped by the roller to the desired depth, catch the log and be lifted, thereby also lifting all logs on top of it and opening the gate. These gates were not water tight, but when constructed with care they leaked little water.[13]

Another type of gate used was the vertical drop log gate. This was a gate that consisted of singular logs, as does the horizontal drop gate, however these were placed and dropped vertically. Since these logs did not have the force of gravity holding them tightly against each other, a wedge was driven into these gates to exert the necessary pressure. This was also a chain operated gate.[14]

A third type of gate was the solid one piece gate. This gate was typically rectangular, and operated within slots in the upright timber as did the horizontal drop log gate. This type of gate usually was not chain driven, but was opened by levering, When it was open it rested on blocks. The solid piece gate was a watertight gate whereas neither of the previously mentioned two were.[15]

The Round Lake dam was an earthen type, with the gates being anchored to a timber foundation laying across the river and buried in the embankments. The gates were of the solid one piece variety, but were adapted to a chain drive method of operation instead of levering.

SECTION 5
The Round Lake Logging Dam

PART 1
Construction and Operation

The Round Lake dam was authorized by Wisconsin Law, Chapter 272, in 1878. According to the Statute it was to be constructed in Sections 22 or 23 of Township 40 North, Range 3 East, on the South Fork of the Flambeau River. Authorization to construct the dam was given to Henry Hewitt, Jr., a Menasha, Wisconsin resident and Chippewa Valley pineland owner, and Eric McArthur. The dam was to be "of sufficient height to flow said streams and lakes, and secure a sufficient depth of water for the easy running of logs."[1] A rather loosely worded set of limitations.

Despite the fact that Hewitt and McArthur were authorized to build the dam, there is no evidence to suggest that they actually did. The dam was ultimately built with one end on Section 23 and the other end on Section 26 of the aforementioned Township and Range. This was land that had been owned by Cornell University. Cornell, nevertheless, sold land including the dam site to Joseph and Charles Viles of Eau Claire, on September 2, 1880. Joseph Viles was the builder of the dam at Little Falls. Therefore, because Hewitt and McArthur never had title to the land, it passing directly from Cornell to Viles brothers, and because Joseph Viles was known to be a dam builder, it is more logical to conclude that Joseph Viles was the one who constructed the dam.[2]

Although there is evidence to support the dam's existence in 1883, its exact date of construction is unknown. It may be concluded, however, that it was built after its authorization in 1878, but before 1886 when it was specifically mentioned in a title transfer deed.[3]

The site selected for this dam was the mouth of the South Fork of the Flambeau River on Round Lake. Although this site did not offer a solid rock bottom, it did fulfill the other requisite conditions for dam site selection. First, the dam was built in the middle of an area rich with white pine. There was also adequate area for the dam to impound water as there were three other lakes linked to Round Lake. In addition, the river ran out of Round Lake at a gradient that was sufficient to drain the impounded water, thereby returning the lakes to their normal level.

The Round Lake dam was a structure built with two distinct portions out of readily available local materials. The first portion, which comprised the greater part of the dam's length, was an earthen embankment to the south. The second portion consisted of the sluiceways and gates, which were constructed of timber and then anchored to the south embankment and a much shorter north embankment. Although both of these portions comprise the whole dam, the timber structure is significant because it not only controlled the release of the logs, it also regulated the water level. This assured that the structure would not be topped and possibly destroyed.

The earthen embankments of the dam seems to be just that, simple earthen embankments. The embankment extends, nevertheless, from the portion forming the dam's south wing to the southeast where some low land was built up. This was a previously mentioned driving improvement, and was pursued at this place to keep the impounded waters

The embankment that extends to the southeast, which prevented impounded water from flowing into a swamp. (John N. Vogel photograph)

from flowing over the bank into a swamp. In addition, the embankment ends facing the water were protected by timber abutments. These were placed to prevent water seepage between the structure comprising the gates and the embankments, thereby preventing potential washouts.

These abutments were constructed of timbers twelve inches square and rose to the height of the embankments. The timbers comprising the abutments were anchored to the embankments by means of a link chain that had a spike on one end. The spike was driven into the back of the timber, while the

other end of the chain was then anchored to a log and buried back in the embankment.

The portion of this dam that comprised the gates and sluiceways was just over fifty feet long. This section consisted of three gates and one part that was filled with ballast. This section of the dam was not placed on a solid rock foundation, therefore it was anchored to several timbers that extended across the river bottom, and were buried in the embankments. From this foundation, then, rose the uprights that would hold the gates as well as a work platform that was twenty-one feet wide and extended the length of the control section. The three gates themselves were fifteen feet wide for the north and center gate and ten feet wide for the south gate. The crib filled with ballast was between the north and middle gate, and was also ten feet wide.

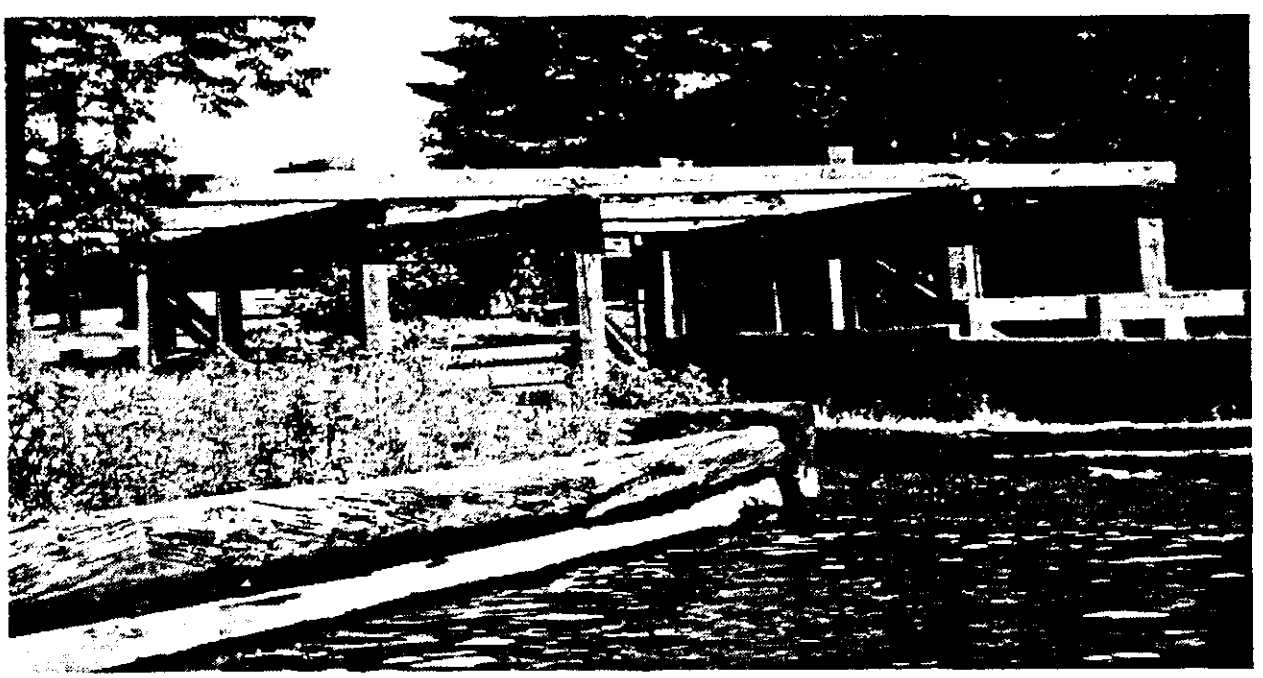
The gates on the Round Lake dam were of the solid one piece variety. Instead, however, of being levered up, these were operated with a simple chain drive system. There were gears on the same plane, one large and one small, for each of the three gate controls. The gears laid on a structure horizontally, with a vertical shaft running down

The gate lifting mechanism in place on the Round Lake dam. (United States Forest Service)

to the decking. A chain was then extended from the vertical shaft to each gate. Consequently, when a crank handle was placed on the portion of the shaft protruding above the small gear and turned, the chain, which was attached to the shaft of the large wheel, would either pull in or give out, thereby controlling the level of the gate.

The sluiceways were constructed to carry the water and logs downstream. All three gates had sluiceways which were planked on the bottom and the sides. The lumber and planks comprising the sluiceways and apron were also anchored to timbers that extended across the stream and were buried in the embankment.

Above the sluiceways was a frame built of timber twelve inches square. The cross pieces of this frame were anchored to uprights that were anchored to the abutments or the timber foundation. While the decking provided a working platform for the men operating the gate mechanisms, this timber frame was the working platform for the men responsible for sluicing the timber through the dam.



The timber structure which provided the working platform for the men sluicing the timber through the dam. (United States Forest Service)

Although the gate portion of this dam was not placed in the exact center of the earthen embankments, it was nevertheless, placed in the center of the bay where the impounded water began its journey downriver. Consequently, it was still able to take advantage of the current and depth of the water it held back.

Once it was complete the dam operated in such a fashion that the logs were floated from the camps around the lake to the dam. It is speculated then that the logs were sluiced through the fifteen foot gate to the north, and then held in the collection pond just downstream. Once the pond was filled with logs the center fifteen foot gate would be opened to wash the timber downstream to the next dam.

The ten foot gate to the south perhaps had three functions. It may have been used for sluicing in conjunction with the north gate, or it may have been held as a back-up gate in case of a malfunction of the north gate. In addition, it also seems possible that all three gates were opened at once, when the dam functioned as a water reservoir for drives downstream. With the large amount of water this dam could impound on four lakes, it could keep logs afloat that were put in the water downriver from the dam.

PART 2
Uses and Ownership

The Viles brothers had purchased the land that included the dam site in 1880. In July, 1882 they then sold an undivided one-half interest in the land to Henry D. Davis of Eau Claire. Davis, then, in 1883 mortgaged his interest in the land for $3,000. This mortgage was obtained for unstated purposes, and was satisfied in July, 1885.[4]

In August, 1885, Henry Davis and his wife Laura conveyed an individed one-half interest of their interest in the land to the Chippewa River Improvement and Log Driving Company, one of Weyerhaeuser's corporations. This was the first time the Weyerhaeuser's concerns had any legal control over the dam, even though it was not total control. This control, nevertheless, was extended in September, 1886, when Charles Viles conveyed an undivided one-fourth interest in the land to the Chippewa River Improvement Company. Joseph Viles, in December, 1886, then conveyed to the Weyerhaeuser concerns "the right to use the undivided one-fourth interest of the lands in Price County, Wisconsin, for the purpose of maintenance and operating the dam now situated thereon, to wit: land including Lot 4, Section 23 and Lot 8, Section 26...."[5]

It becomes apparent from these title transfers,

that Weyerhaeuser valued the Round Lake dam as an integral part of his Chippewa River Valley driving network. After all, this was the dam that would start many downstream drives on the main drainage system within the upper reaches of the valley.

At different points in 1888, Charles Viles and Joseph Viles transferred their remaining interest in the land around the dam to Bradford Viles. Ownership of the dam and its surroundings now rested with Bradford Viles and the Chippewa River Improvement and Log Driving Company.[6]

In 1890, however, a portion of the interest in the land around the dam was conveyed to Price County for nonpayment of taxes. Price County then conveyed their interest in the land to C. O. Law in May, 1892. The portion of the interest transferred in this conveyance, had no doubt been the portion belonging to the Weyerhaeuser concerns. This is virtually certain because Bradford Viles had retained ownership of his interest in the land, subsequently transferring it to the Chippewa River Improvement and Log Driving Company in July, 1894. The Chippewa River Improvement and Log Driving Company obtained full control over the dam and its surrounding area, then, when C. O. Law and his wife Millie transferred their interest back to them in August, 1895.[7]

That the Chippewa Valley and Weyerhaeuser affiliates were not totally concerned with the prompt payment of property taxes becomes evident when the dam and its surrounding land were sold to J. L. Gates by Price County in July, 1899. The J. L. Gates Lumber Company was an operation financed by the Pfister family in Milwaukee. The company bought cut over land and tried to colonize it. J. L. Gates, nevertheless, conveyed the property back to the Chippewa River Improvement and Log Driving Company in July, 1906.[8]

The Weyerhaeuser concerns had an obvious interest in this dam when the Pool was in full operation cutting and supplying timber to all of the Chippewa River and Mississippi River mills. During the 1880s this dam initiated the long trip downriver to those mills for much of the timber logged by the Pool. The full scale milling operations along the Chippewa and Mississippi Rivers began to run out of white pine in the 1890s. The operations continued to curtail activities until July 28, 1901, when the last lumber raft left Eau Claire heading down the Chippewa River. The end of the milling activity in Eau Claire seems to correspond roughly with the Chippewa River Improvement and Log Driving Company's

loss of the dam to Price County. That was when the owners were willing to give it up for back taxes. This does not explain why the Chippewa River Improvement and Log Driving Company obtained title to the dam again in 1906.

We do know, however, that the prices of white pine went up considerably in this period, after the supply was depleted. Thus, the value of sunken logs and timber in the backwaters became valuable and the logging companies sent crews out to reclaim their discarded property. Consequently they would need the flushing capabilities of the Round Lake dam to float these recovered logs downriver.

In the 1890s and subsequent years, as milling was ceasing on the Chippewa and Mississippi Rivers, many small mills were being built in Fifield, about twenty miles down the South Fork from the dam. A railroad, the Wisconsin Central, had been built through Fifield and it provided a good means for these millowners to ship their products to market; the millowners no longer had to rely on the river controlled by outside investors.

The first mill in Fifield was the Van Dusen Mill or Fifield Manufacturing Company. It was built in 1891 with a capacity of 100,000 board feet per day. This mill operated until 1898. Other Fifield mills included the Liebelt and Landgraf Mill, built in 1899 and later sold to the Patterson Brothers, and the Central Lumber Company and Shingle Mill, built in 1902.[9]

Throughout the 1890s, then, it is likely that some of the timber cut along the South Fork and Round Lake was driven only as far as the sorting works and mills at Fifield, while the rest of it continued down the river to the Chippewa River and Mississippi River mills. After the turn of the century, however, very little if any of the timber cut around Round Lake seems to have gone all the way downriver, most of it being milled in Fifield.

In October, 1906, the Chippewa River Improvement and Log Driving Company sold the dam to the Menasha Wooden Ware Company. It was during their ownership that the last drive on the South Fork, through the dam took place. This last drive occurred in April and May, 1909, and involved about 5,000 logs being sluiced through the dam. The logs being driven through the dam were cut by the Patterson Lumber Company and were being driven to Fifield where they were to be milled.[10]

The next owner of the Round Lake dam was Otto C.

Doering an early vice president of Sears Roebuck and Company, Chicago. The Doering family made their first journey to this portion of the Wisconsin northwoods in 1902 when they camped near Pike Lake. The Doerings, subsequently, became enchanted with the region and sought to buy land. Having selected the land around the mouth of the South Fork and Round Lake for purchase, Doering and the Menasha Wooden Ware Company negotiated a sale. Consequently, in June, 1911, Doering purchased Lots 3 and 4 in Section 23 on the north bank of the river. Then, in July, 1912, he purchased Lot 8 in Section 26 on the south bank of the river.

These were the lots that the dam was affixed to, yet each of the deeds "expressly excepts from this conveyance and reserves to itself, its successors and assignees, that certain dam and wings and approaches thereto, constructed across the branch of the Flambeau River which is the outlet of Round Lake...." The Menasha Wooden Ware Company ultimately relented, and in April, 1915, conveyed the dam and all its parts to the Doerings.[11]

These purchases were the beginnings of the Doering lake resort, an estate that encompassed 2,876 acres in Price County and seventy acres in Vilas County. Included within the estate was all the frontage on Tucker Lake and Jupa Lake, one-half of the frontage on Round Lake and all of the South Fork frontage down to Fishtrap. The estate required nine miles of fencing to protect portions of it.[12]

The buildings on the estate numbered twenty-eight and consisted of a main lodge, a guest lodge, family member lodges, a kitchen and dining lodge, caretakers house and many barns and storage buildings. The quality of these lodges was demonstrated by the dining lodge which was built in 1929. It had hemlock bark shingles, stained glass windows and all hand made furniture.[13]

It is apparent from all of these purchases, that the Doerings were people with financial means. They were very concerned with preservation and conservation, and had the finances to do something about it. One of the items that Mr. Doering decided to preserve was the old Round Lake logging dam. The dam had been unused since the drive of 1909, except for its help in maintaining the lake level.

Alfred Herbst, a Doering Estate caretaker, began working for the family in 1927. Shortly after his employment, he remembers that Mr. Doering became concerned about the lake pressure against the dam. Consequently, in the late 1920s long telephone type

Some of the Doering Estate buildings. The dining hall is on the left. (United States Forest Service)

poles were extended across the river in front of the dam to regulate the lake level. This was successful and the dam officially ceased to serve a useful purpose.[14]

Doering took further steps to preserve the dam in the 1930s, when he and his caretakers rebuilt it. Mr. Herbst related that Doering was an ardent conservationist. Consequently, when the dam was rebuilt, it was rebuilt, "just as the original dam was." If this is true, the present construction perhaps represents the original structural components.[15]

Due to this rebuilding, very little of the timber now existing in the dam is original. The center flood gate which remains today, as well as the two upright pilings on either side of it are original timber, but that seems to be it. Mr. Herbst also believes that some if the sluiceway planks may yet be original, but many of those were replaced in the 1960s.

Doering's concern for the dam and its preservation caused him to also rebuild the downstream collection area a few years later. It was due to the efforts of O. C. Doering, consequently, that the dam was preserved and remains as one of the important artifacts of the original lumbering era.[16]

Otto C. Doering died on April 3, 1955, and Mrs. Doering died shortly thereafter. Two of the Doering

sons inherited the property, but because they lived in the east and had vacation homes in New England, they returned to the northern Wisconsin estate less and less frequently. Finally in 1968, they decided to sell it.[17]

They offered it for sale to the Department of Agriculture, U. S. Forest Service. A sale was negotiated, and on July 16, 1968 title passed from the Doering family to the United States of America. Consequently, the land is back in the possession of the original owners, the federal government.[18]

PART 3
Present Condition

The dam was inspected on April 25, 26 and 27, 1980, as well as May 2, 3 and 4, 1980, and was found to be intact, although in a deteriorating condition. The timber gate portion of the dam is rapidly giving way. The earthen embankments have weathered the past one hundred years well and have a large number of sizable trees growing on them.

The southern embankment has survived in good condition. (John N. Vogel photograph)

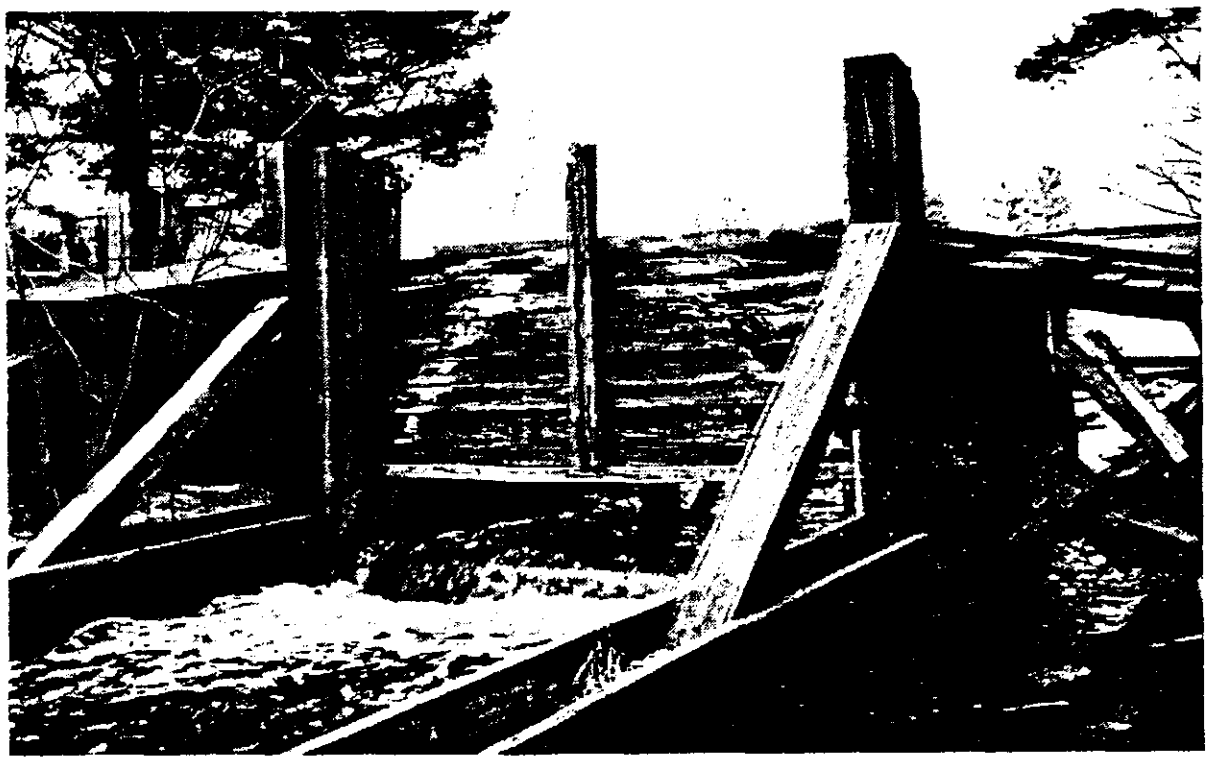
The sections that show the greatest deterioration are the abutments on the north and south banks, immediately under the dam's decking. The south abutment had almost completely collapsed, thereby allowing the south side of the decking to sag and settle badly. The north abutment had fared better, although it is also collapsing. It has been restrained by pilings driven into the river bottom to support the decking. These pilings have given out under the stress on the south side.

The upstream timber abutment on the north embankment is also deteriorating. This part has no current bearing on the structural condition of the dam, however, because this portion of the abutment is not weight bearing. This deterioration, nevertheless, could cause future problems because it will promote the seepage around the side of the dam that it was built to prevent.

The upstream abutment on the north embankment is rotting away. This could promote seepage around the end of the dam that might later lead to a washout. (John N. Vogel photograph)

The decking of the dam is still intact despite the sagging on the south end. Decking timbers were among the last items to be replaced by the Doering caretakers prior to the sale to the U. S. Forest Service.

There were five heavy upright timbers on the downstream side of the dam that were mortised into the timber foundation. These uprights provided much of the support for the decking, as well as the slots in which the gates operated. Two of the five uprights, the ones on either side of the main flood gate, remain today as original timber. These two original uprights, however, are rotting badly at the top and bottom, especially where they join the foundation. It was due to this deterioration, in addition to signs of deterioration on the three uprights that were replaced, that the Forest Service drove support pilings into the riverbed behind them. The Forest Service also installed a roll



The center flood gate with pilings on either side. This is the only apparent original timber in the structure. Note on the right that the south embankment has collapsed and that the deck is sagging badly in that spot. (John N. Vogel photograph)

rock dam in front of the structure, thereby insuring that lake pressure would do no additional damage to the dam.

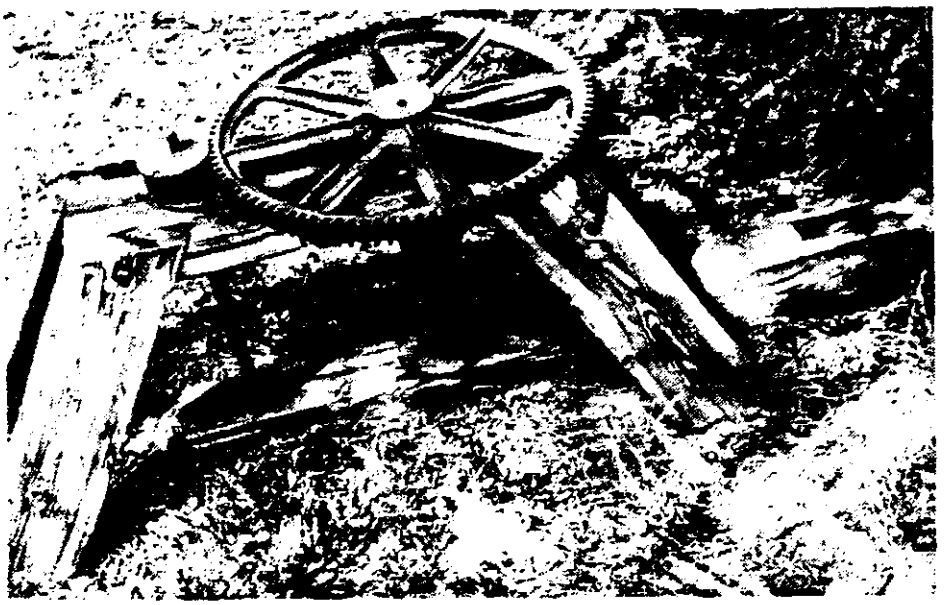
Two of the three gates that operated within these uprights are gone, the only remaining one being the center flood gate. This gate is also made of original hand hewn timber, but it is rotting badly at the top

The two southern most sluiceways seem to have fared very well, both being almost completely intact, and in seemingly good condition. The northern sluiceway bottom, nevertheless, is gone, the bottom being the riverbed.

The log collection pond immediately downstream from the dam, also had a timber abutment around its perimeter. Despite the fact that this abutment was completely replaced in the 1930s, constant exposure to the water has rotted much of it out. It needs replacing in its entirety.

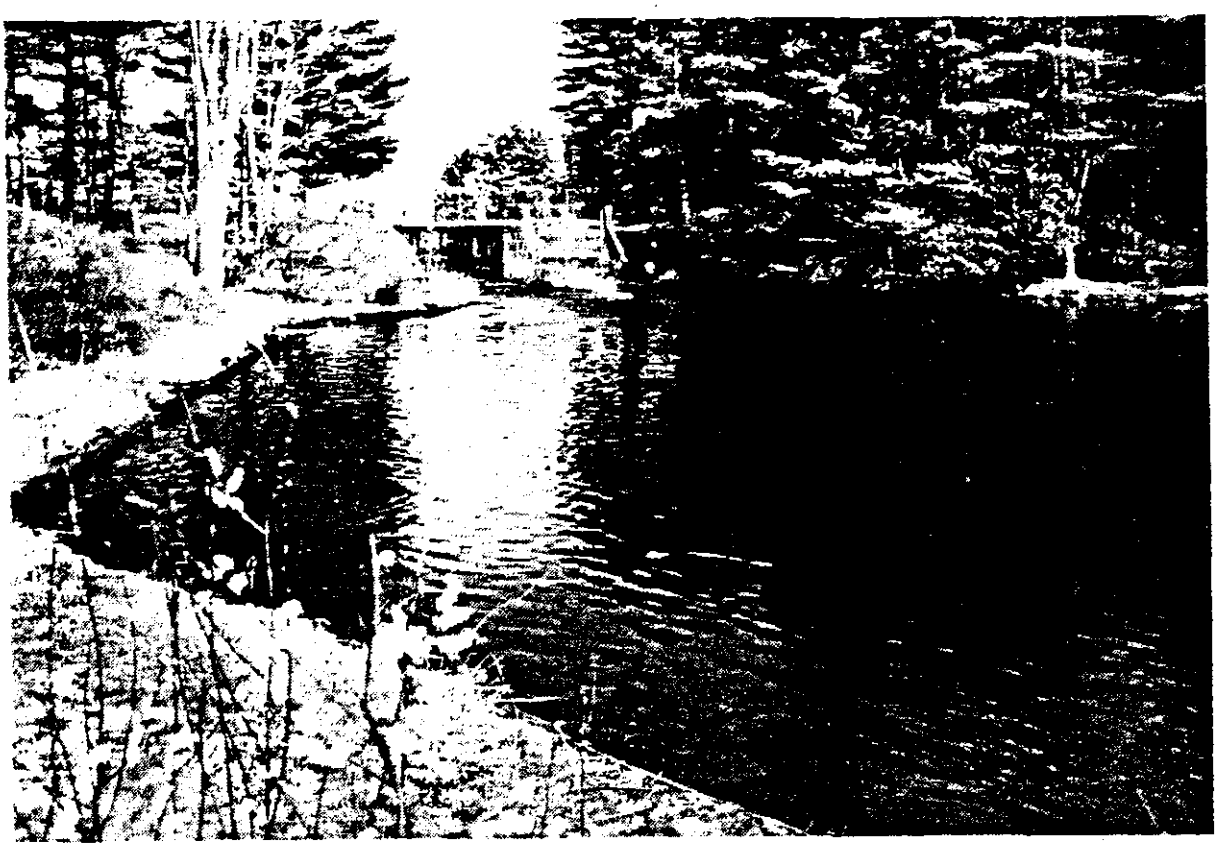
The machinery used for raising and lowering the flood gates on the dam is no longer on the site. It has been removed and placed at a Forest Service storage site to protect it from vandals. The wooden structures which held the drive gears

are in fair condition, as are most of the gears themselves. The one exception is one of the large gears where the center has been broken out.



One of the gate lifting mechanisms as it sits today at a Forest Service storage site. (John N. Vogel photograph)

The Round Lake logging dam and downstream collection pond. (John N. Vogel photograph)



SECTION 6
The Dam's Significance

The significance of the Round Lake logging dam can be discussed in five different categories: its place in the corporate lumber history of the Chippewa flowage, its relationship to the founding of Cornell University, its role in understanding the developmental phases of Wisconsin logging practices, its representative function as an object of folk technology and as an artifact in the history of historic preservation in the State of Wisconsin.

The Round Lake dam was built in the Chippewa Valley, the largest pine producing watershed in the State, and was located on the South Fork of the Flambeau River, the largest drainage system in the upper Chippewa Valley. Through this dam flowed millions of feet of logs, down to the mills along the Chippewa and Mississippi Rivers. This white pine became a key ingredient in the building of many new immigrant homes and other nineteenth century structures.

The dam is also significant because it exists on land that once belonged to Ezra Cornell and Cornell University. As a result, the land in this area became involved in one of the most successful speculation schemes in American History. The dam is not significant so much because it merely sits on that land, but rather because the history of this dam will always remind others of this age of exploitation, individualism and corporate imperialism. The Round Lake dam's significance is further enhanced by its direct affiliation and use by Frederick Weyerhaeuser and his associates, one of the most powerful lumber combinations in our nation's history.

The Round Lake dam was constructed during the third stage of Wisconsin's lumbering history. It is a good representation of both a sluicing and a flushing dam in the third or booming stage of logging development. It is also a unique structure in that it was used by local sawmills after the large corporate industries pulled out of the area. Consequently, it also represents a second stage logging dam serving a local sawmill with a regional market.

The nineteenth century was a period of rapid technological change and the introduction of scientific ideas into industrial production. The technology of the lumberjack, however, did not

experience the great changes that were occurring in the lumber industry, as well as in American Society. The lumberjacks became noted for their folk tales. The Round Lake dam is an important artifact of folk history. The technology of this dam is part of an unwritten tradition and should be preserved as one of the last surviving representations of the timber transportation techniques of the woodlands.

Wooden structures deteriorate in a period of time, especially when exposed to wind, sun and water. The original Round Lake dam, though it had regular maintenance, deteriorated after fifty years. A concerned preservationist, Otto C. Doering, rehabilitated the structure in the 1930s and thus preserved the only known representative of a logging dam in northern Wisconsin. The efforts of Mr. Doering have now become a part of the history of historic preservation in the State. A history that is full of buildings and specific monuments but has very few examples of industrial technology.

Accordingly, the Round Lake Logging Dam must be restored. Its condition, however, is deteriorating so rapidly that immediate action is required to protect it and the lessons in dam construction that it can teach from the imminent dangers it faces from the elements and vandals. To this end, we recommend that the dam be dismantled this fall, thereby limiting its exposure to danger. Dismantling and storing the material could be conducted by a Forest Service crew under the supervision of an engineer, historian and archeologist. Ideally the engineer and the historian should be secured from those who have participated in this study, due to their familiarity with the dam. The archeologist could be a Forest Service staff archeologist. These professionals would be responsible for documenting and recording the dismantling process, as well as reassembling the data to assist in the reconstruction of the dam.

Once the dam has been dismantled, plans to rebuild the dam may proceed. In addition, it will be necessary to issue a planning grant to study the feasibility of, and type of public information center to be built in conjunction with this project. It will also be necessary to determine if a center should be manned, as well as what type of educational information will be presented.

Finally, a planning study should also be conducted to determine where a public access road should be built. The road should allow people direct

access to the site without jeopardizing the environment or the adjoining Wilderness Area.

FOOTNOTES

Section 1

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[3]Fries, Empire in Pine, pp. 25-44.

[4]Ibid., pp. 62-63.

[5]Ibid., pp. 60-62.

[6]Merk, Economic History, p. 84.

[7]Ibid., pp. 83-84.

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[2]Ibid.

[3]Charles E. Twining, Downriver, (Madison: The State Historical Society of Wisconsin, 1975), p. 29,31.

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[6]Larson, History of White Pine, p. 27; R.K. Boyd, "Up and Down the Chippewa River," Wisconsin Magazine of History, XIV March 1931, p. 252.

[7]Twining, Downriver, p. 107; Hidy, et al., Timber and Men, p. 46. Merk, Economic History, pp. 91-92.

[8]Twining, Downriver, p. 107.

[9]Ibid., pp. 108, 109.

[10]Ibid., pp. 109, 110; Hidy, et al., Timber and Men, pp. 46-47.

[11]Hidy, et al., Timber and Men, p. 48.

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[13]Hidy, et al., Timber and Men, pp. 53, 59, 62, 63.

[14]Twining, Downriver, p. 165; Hidy, et al., Timber and Men, p. 72.

[15]Twining, Downriver, pp. 185-186; Hidy, et al., Timber and Men, pp. 72-73.

[16]Hidy, et al., Timber and Men, pp. 72-73; Twining, Downriver, p. 189.

[17]Hidy, et al., Timber and Men, p. 73.

[18]Ibid., p. 74; Twining, Downriver, p. 206.

[19]Twining, Downriver, p. 206.

[20]Hidy, et al., Timber and Men, p. 99.

[21]Fred W. Kohlmeyer, Timber Roots - The Laird, Norton Story, 1855-1905, (Winona: Winona County Historical Society, 1972), pp. 206, 209.

[22]Paul W. Gates, The Wisconsin Pine Lands of Cornell University, (Ithaca: Cornell University Press, 1943; Reprint, Madison: State Historical Society of Wisconsin, 1965), p. 21.

[23]Ibid., pp. 49, 53, 55, 56.

[24]Ibid., pp. 56, 57.

[25]Ibid., pp. 61, 77.

[26]Ibid., p. 94.

[27]Ibid., pp. 95, 105.

[28]Ibid., pp. 100, 106.

[29]Ibid., pp. 86, 87, 144.

[30]Ibid., pp. 215-219; Deed from Ezra Cornell to Cornell

University, 13 October 1874, Deeds and Records of Price County, Phillips, Wisconsin.

[31]Gates, Wisconsin Pine Lands, p. 221.

[32]Ibid., p. 235.

[33]Ibid., pp. 242-243.

Section 3

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[10]Ibid., p. 33.

[11]Ralph W. Hidy, Frank E. Hill, Allan Nevins, Timber and Men, (New York: MacMillan, 1963), pp. 65, 78; Paul W. Gates, The Wisconsin Pine Lands of Cornell University, (Ithaca: Cornell University Press, 1943; Reprint, Madison: The State Historical Society of Wisconsin, 1965), p. 132.

[12]Hidy, et al., Timber and Men, p. 66.

[13]Ibid.; Fred W. Kohlmeyer, Timber Roots - The Laird, Norton Story, 1855-1905, (Winona: Winona County Historical Society, 1972), p. 99; Northwestern Lumberman, October 19, 1878, p. 3.

[14]Charles H. Henry, "Cruising, Surveying, Logging and Log Driving and Dam Building in Pioneer Days of North Wis.," Eau Claire Leader, March 9, 1916.

[15]Ibid.; Charles H. Henry to William Bartlett, 18 May 1928, William W. Bartlett Collection, L.E. Phillips Memorial Public Library, Eau Claire, Wisconsin.

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[17]Northwestern Lumberman, November 16, 1878, pp. 2, 3.

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[19]Charles H. Henry to William Bartlett, 18 May 1928, Bartlett.

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[3]Brown, Logging, p. 237; Forbes, Forestry, p. 58; Pulp and Paper Research Institute, River Drive, p. 62.

[4]Fred W. Kohlmeyer, Timber Roots - The Laird, Norton Story, 1855-1905, (Winona: Winona County Historical Society, 1972), p. 175; James Leffel, Construction of Mill Dams, (Springfield: James Leffel and Company, 1881; Reprint, Park Ridge: Noyes Press, 1972),pp. 44, 46.

[5]Edward Wegmann, The Design and Construction of Dams, 8th ed., (New York: John Wiley and Sons, Inc., 1927), p. 221; Leffel, Construction, pp. 20-21.

[6]Pulp and Paper Research Institute, River Drive, pp. 34-36; Brown, Logging, p. 240.

[7]Pulp and Paper Research Institute, River Drive, p. 39.

[8]Ibid., pp. 36, 44, 45.

[9]Wegmann, Design of Dams, p. 281.

[10]Pulp and Paper Research Institute, River Drive, p. 79; Brown, Logging, p. 238.

[11]Leffel, Construction, pp. 6, 21; Brown, Logging, p. 239.

[12]Brown, Logging, p. 238; Forbes, Forestry, p. 58.

[13]Pulp and Paper Research Institute, River Drive, p. 72.

[14]Ibid., pp. 75-76.

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[5]Deed from Charles and Ada Viles to Chippewa River Improvement and Log Driving Company, 20 September 1886, Price County; Deed from Henry D. and Laura J. Davis to the Chippewa River Improvement and Log Driving Company, 29 August 1885, Price County; Land Contract from Joseph Viles to Frederick Weyerhaeuser, et al., 17 December 1886, Price County.

[6]Deed from Charles and Ada Viles to Bradford Viles, 5 November 1888, Price County; Deed from Joseph and Lucilla Viles to Bradford Viles, 10 December 1888, Price County.

[7]Conveyance to Price County, 20 May 1890, Price County; Deed from Price County to C.O. Law, 17 May 1892, Price County; Deed from Bradford and Jessie Viles to Chippewa River Improvement and Log Driving Company, 12 July 1894, Price County; Deed from C.O. and Millie Law to Chippewa River Improvement and Log Driving Company, 1 August 1895, Price County.

[8]Deed from Price County to J.L. Gates Land Company, 5 July 1899, Price County; Gates, Wisconsin Pine Lands, pp. 240-241; Deed from J.L. Gates Land Company to Chippewa River Improvement and Log Driving Company, 9 July 1906, Price County.

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[10]Deed from Chippewa River Improvement and Log Driving Company to Menasha Wooden Ware Company, 1 October 1906, Price County; Larry Johns, "Last Log Drive on the South Fork," The Park Falls Herald, November 29, 1979.

[11]Lessard, Fifield, p. 86; Deeds from Menasha Wooden Ware Company to O.C. Doering, 27 June 1911, 18 July 1912, 28 April 1915, Price County.

[12]Lessard, Fifield, p. 86; Interview with Alfred Herbst, Park Falls, Wisconsin, April 26,1980.

[13]Lessard, Fifield, p. 86; Interview with Herbst, Arpil 26, 1980.

[14]Interview with Herbst, April 26, 1980.

[15]Ibid.

[16]Ibid.; Interview with Alfred Herbst, Park Falls, Wisconsin, May 3, 1980.

[17]O.C. Doering Probate, 25 August 1960, Price County; Interview with Herbst, April 26, 1980.

[18]Deed from Otto C. Doering, Jr. and Lucy T. Doering, and Paul M. Doering and Marian H. Doering to the United States Department of Agriculture, 16 July 1968, Price County.

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